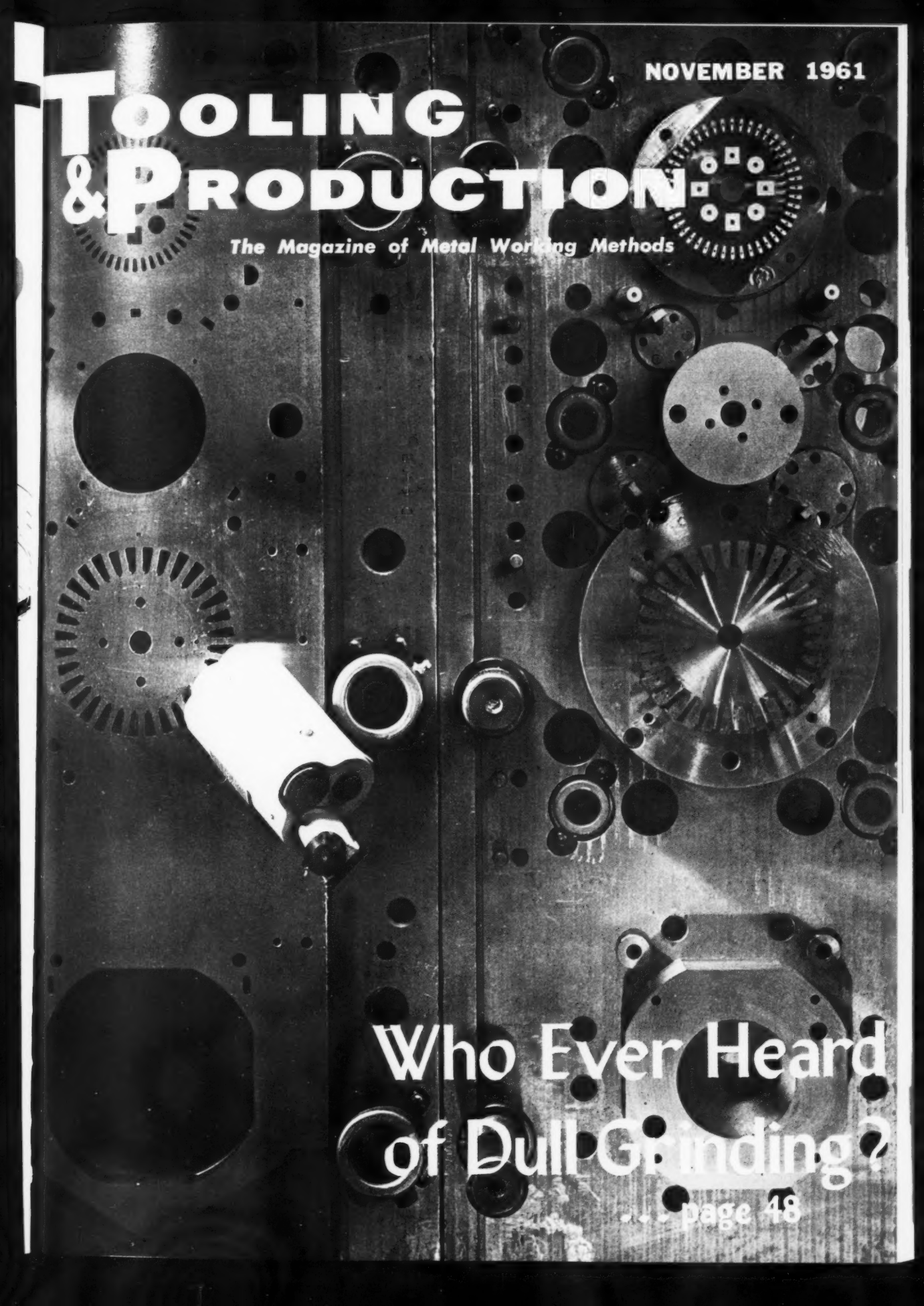
NOVEMBER 1961

TOOLING & PRODUCTION

The Magazine of Metal Working Methods



Who Ever Heard of Dull Grinding?

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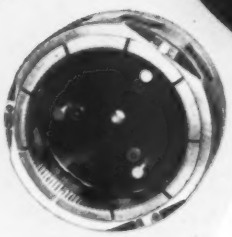
Tool Engineers Bring Tough Work-Holding Problems to SUTTON



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TOOLING & PRODUCTION
The Magazine of Metal Working Methods

VOL. 27, No. 8
NOVEMBER 1961

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TOOLING & PRODUCTION MAGAZINE

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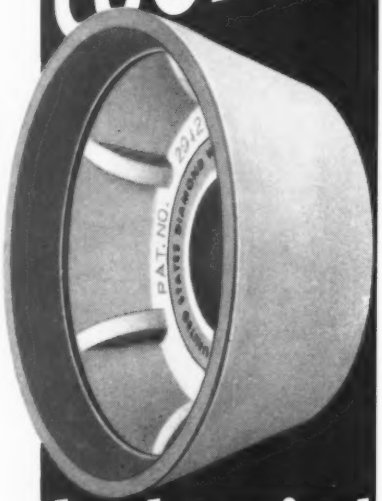

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Personally Speaking...

Dear T & P Reader:

A few days ago I had the opportunity of attending a meeting which was addressed by Hickman Price, Jr., Assistant Secretary of Commerce for Domestic Affairs. He made a point about foreign trade that every American should take to heart. Essentially, his conclusion was that either we make export sales our principal aim in life, nationally, or become second rate as a nation.

Regarding business, Mr. Price made the point that G.N.P. for the first quarter '61 was at the annual rate of 501 billion dollars, and that it will be up to a 540 billion rate by the end of 1961. This recovery, of course, was well on its way long before the present administration came into power.

Some other figures he revealed related to machine tool production. He stated that in the years 1958-59 and '60, the U.S.S.R. produced 317 thousand machine tools, which exceeded the number that were produced by the United States for the entire 14 year period from 1946 to 1960. In this connection, he also mentioned that 80% of West Germany's machine tools were new since 1952, while 83% of ours were new prior to 1946. I wonder what is the average age of machine tools in the U.S. that are actually in production use. Have you ever considered this question? What are your plant's figures?

Another significant statement Mr. Price made was that we must cut our labor costs to offset the much lower foreign labor rates. Do you know what this means? It means more automatic manufacturing. It means numerical control and other methods for producing more with less man hours.

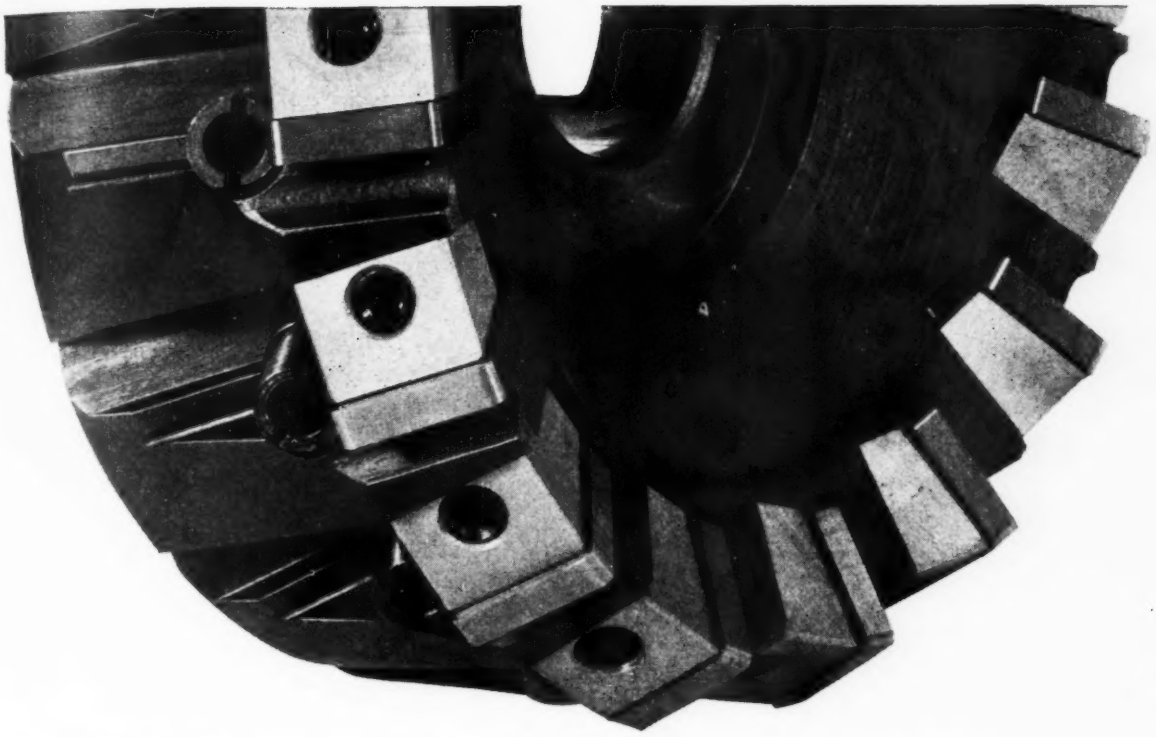
The foregoing comments about export business bring me to a rather pleasant subject. My family, this year, has the great pleasure and privilege of being the foster family to a foreign student. There are something over 2,000 of them here this year through the sponsorship of the American Field Service. We have a girl from Bogota, Colombia, who attends our community high school as a member of its senior class. Aside from the fact that she is a wonderful young person, there are some things she brings to us that we can all take to heart.

For example, she speaks three languages fluently—Spanish, French and English. And this is a basic requisite to comfortable, friendly relations in foreign trade. Mr. Price emphasized our extreme lack of linguists among Americans who are attempting to carry on trade with foreign countries. If you want to do business in Brazil, you should have a workable knowledge of Portuguese. Spanish, of course, otherwise, serves everywhere south of our Mexican border and in Spain. There is no end to this need for knowledge of foreign languages, and it is something that should be emphasized much more strongly with our young people. Getting back to A.F.S. for a moment, this program is most commendable, and if you have a chance to support it in any way at all, I urge you most strongly to do so.

Cordially yours,

Ray Hickner

Publisher



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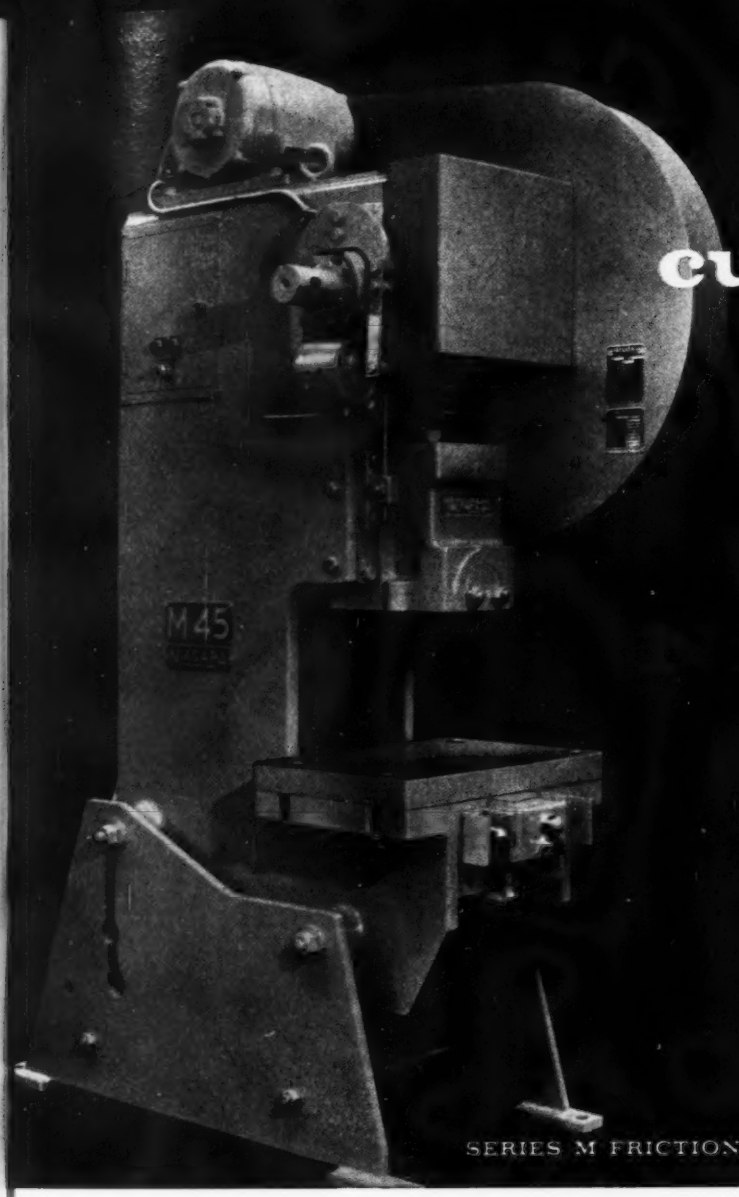

what customers like most about new OBI line

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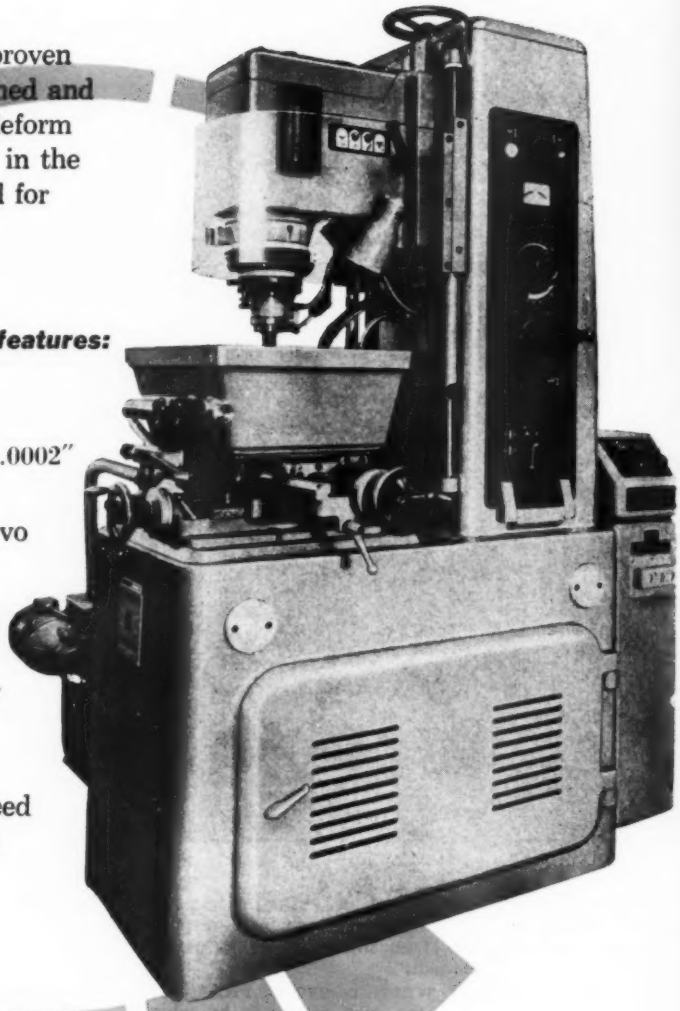

Here are some of its outstanding features:

- Magnetic electrode holder for working and locating within ± .0002″
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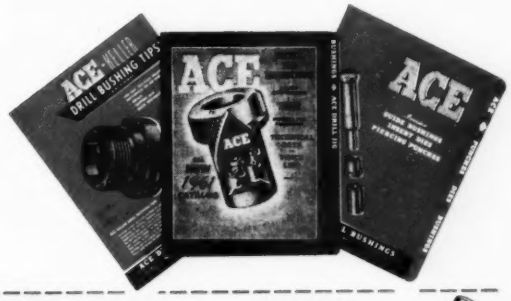

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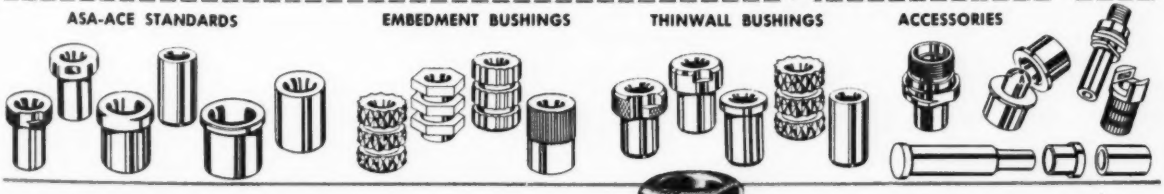

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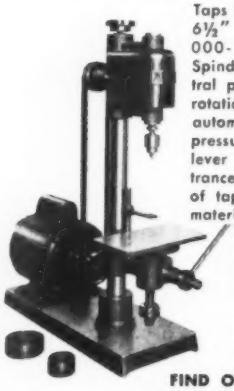

Taps to the center of a 6½" circle. Capacity, 000-120 to 10-24. Spindle returns to neutral position and stops rotation instantly and automatically when pressure on the feed lever is released. Entrance and withdrawal of tap is *gentle*. Thin materials are tapped without stripping. Brittle materials without chipping. Blind holes without tap breakage.

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CIRCLE INFORM-A-GRAM KEY NO. 10

Talk of the Month

What Quality Control Means to Management

by Norbert L. Enrick

Based on a talk given by Mr. Enrick at the general session of the Sept. 30 Quality Control Clinic sponsored by the Muskegon (Mich.) Manufacturers' Assn., and the Greater Muskegon Section, American Society for Quality Control. Mr. Enrick is associate professor at the Univ. of Virginia Graduate School of Business Administration, Charlottesville, Va.

Prof. Enrick

QUALITY CONTROL has become of paramount importance in industry, as a management tool for maintaining the close tolerances specified for today's precision production.

Shops that have introduced modern QC techniques have achieved substantial savings in reduced scrap and lower inspection labor. Typical is one manufacturer who, after a two year installation experience, reduced from 22 to 10 inspectors, with annual savings of more than $80,000. He also saved several hundred thousand more in reduction of scrap, rework, hidden defects and field complaints.

Yet many shops are still ice cold on the possibilities that a **modern** quality control program can bring, with its emphasis on defect prevention in place of defect segregation in the finished product.

There are numerous plants where there is some inspection done, and where someone checks into customer complaints. This is a "quality control program" in name only. It does not represent the kind of quality control that really saves money. Let's consider what quality of product really means, how it is attained and maintained, and how quality control can be "a real gold mine."

Prime Sources of Quality

Quality or goodness of product does not come into being by accident. It is the result of the planned and interlocked activities and efforts of all the elements of an organization. Like cost, it is a measurement of the over-all efficiency of a manufacturing concern.

The sources of quality are three: design, workmanship and uniformity.

When we talk of design, we ask "How adequate, how pleasing and how simple and functional is the design?" Answers come from the engineering or design department, assisted by data and reports from production, quality control and the field. Relevant data, used as an aid in planning and research, plus special studies and constructive imagination all contribute to the ultimate quality of design.

As production is initiated, quality becomes a function of workmanship. How much pride and skill go into the operations performed? Are things made just "good enough to get by," or is overall morale such that work is done in a manner that reflects credit both on the worker and the organization? Written standards, sound specifications, and proper selection and training programs are partial answers. Much depends upon the over-all outlook that management is able to impart and the climate that has prevailed in the past.

Finally, quality is a function of uniformity. All things vary, and no two articles are exactly alike. At best, a design represents an average of all the details of measurement, performance characteristics and appearance that were contemplated by the designer. Uniformity of product can be greatly enhanced if foremen, workmen and maintenance crews are aided by statistical quality control procedures.

Since quality flows from the three prime sources of design, workmanship and uniformity, which in turn are dependent upon a large number of factors operat-

. . . **Continued on page 12**

NEW HAMILTON VARIMATIC® SUPER SENSITIVE DRILLING MACHINE

The NEW Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole, Precision Drilling Machine is, by far, the smoothest Varimatic we have ever built. It has fewer parts, is subject to less wear, and requires less maintenance than ever before. Tolerances have been tightened. Working clearances have been increased. It offers flexibility and sensitivity, accuracy and stamina far beyond the requirements of the average user.

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CIRCLE INFORM-A-GRAM KEY NO. 11

. . . Month's Talk from page 10

ing within the concern, management must be involved in order to attain and maintain quality economically.

Where top management has paid the attention to quality control that it deserves, the rewards have been rich in terms of enhanced saleability of product, reduced scrap, rework and waste, and increased productivity.

Management Action Required

What are the steps that top management might logically take to insure good quality at low cost? To set sound quality policies, top management must know the quality that is being produced. Data should be secured on such items as inspection costs, sorting costs, rework and repair, scrap and waste, complaints, service calls and replacements.

When such a "quality audit" is prepared, and all pertinent data are gathered, the cost of poor quality is often found to be astoundingly high. Most ordinary accounting procedures do not provide for the comprehensive presentation of losses from poor quality. Even if they did, such figures would not include loss of customers from quality disappointment, and the sales department cost of acquiring new customers!

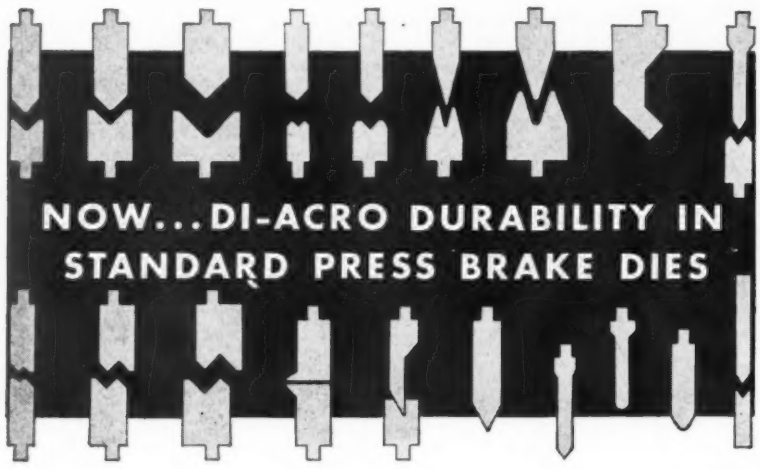
Once the cost data are on hand, management will be more ready to provide the necessary financial support to implement a good quality control program. This expense is not usually high. Factors of inspection and testing instruments, inspection and laboratory personnel, and quality control engineers must be considered initially. Eventually, such expenditures turn out to represent but a small fraction of the savings accomplished. But there will be some initial costs, and there must be adequate budgetary allowance to get a sound program going. When an analysis of hidden inspection costs is made —the costs of regular productive employees spending high labor-rate time on inspection, sorting and screening — this cost will be found to far outweigh the more visible cost of controlled inspection under a quality control program.

As a final step, the quality control program must be fitted into the organization. This means selection of a man or men to staff the quality control function and to delineate how the newly created group shall fit into the overall program of the company.

As the program gets under way, management must give it continued support. There will be times, especially in the beginning of the program, when the quality control department created may represent just a burdensome "extra expense;" when foremen and operators complain because equipment, inadequate to properly produce the desired quality, is to be shut down for replacement of bearings or for realignment of parts.

Cost for repair parts, downtime and maintenance may go up. These experiences, however, will be temporary. As equipment is put in proper shape, productivity and quality will soon rise above prior levels, and scrap, rework, seconds

. . . Continued on page 14



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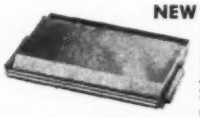

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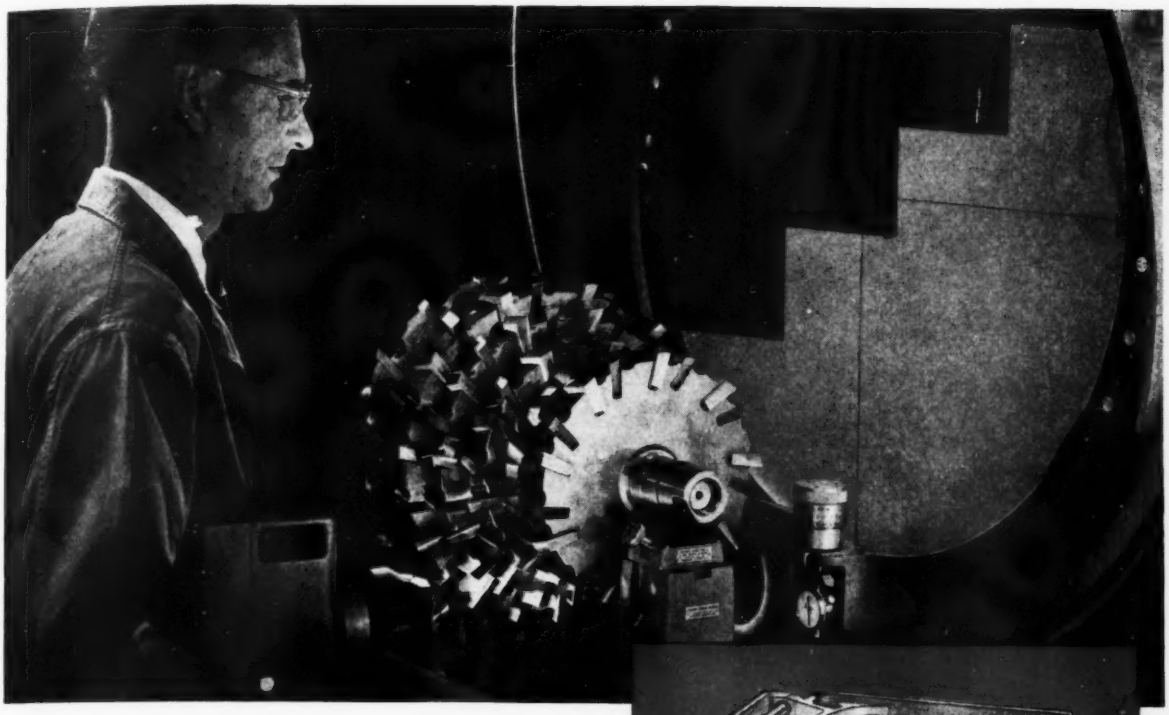
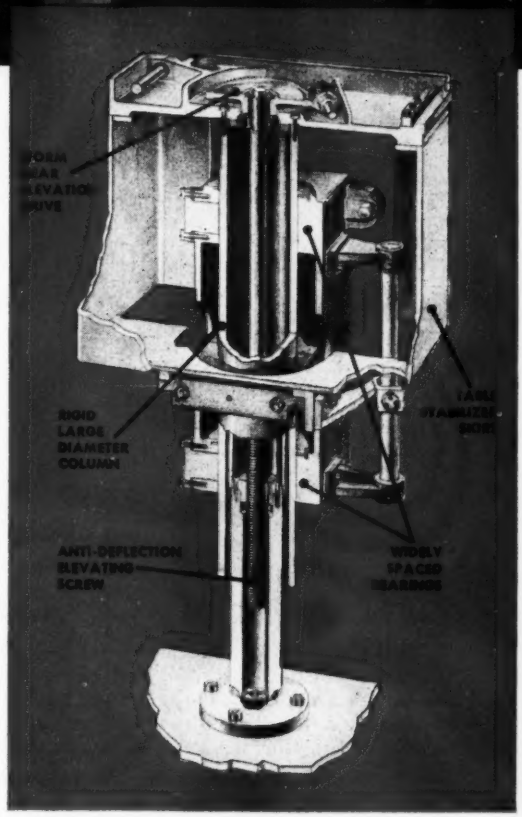
CIRCLE INFORM-A-GRAM KEY NO. 12





Built by EX-CELL-O

To Insure Accuracy

Rugged, precision construction of Ex-Cell-O Contour Projectors results in stable support for the optical systems providing accuracy in the order of .0001". This rigidity is a major consideration in achieving for Ex-Cell-O Projectors an outstanding record of trouble free operation and almost total elimination of down time.

Typical of the sturdy, precision workmanship to be found throughout Ex-Cell-O Contour Projectors is the worktable of the Model 14-5 and Model 30. Engineers will recognize the superior design features shown in the inset at right. To cite just a few, the large 5" O.D. columns, supported in widely spaced bearings; the heavy channel skirt to stabilize the table assembly and the flexible elevating screw which can't impart deflections to the column.

Because of these construction features Ex-Cell-O Contour Projectors support heavy loads firmly, yet move easily and smoothly.

Whether your problem involves receiving, production or final inspection there's an Ex-Cell-O Contour Projector to do the job accurately, quickly and at low cost. The "why" and "how" is condensed in our new booklet—"43 Reasons Why Ex-Cell-O Contour Projectors are the First Choice of Industry." Yours for the asking!

Manufactured by EX-CELL-O Corporation at Detroit, Mich.

SOLD AND SERVICED BY

CP61-2

OPTICAL GAGING PRODUCTS, INC.

26 FORBES STREET ROCHESTER 11, N. Y.

Subsidiary of EX-CELL-O Corporation

CIRCLE INFORM-A-GRAM KEY NO. 13

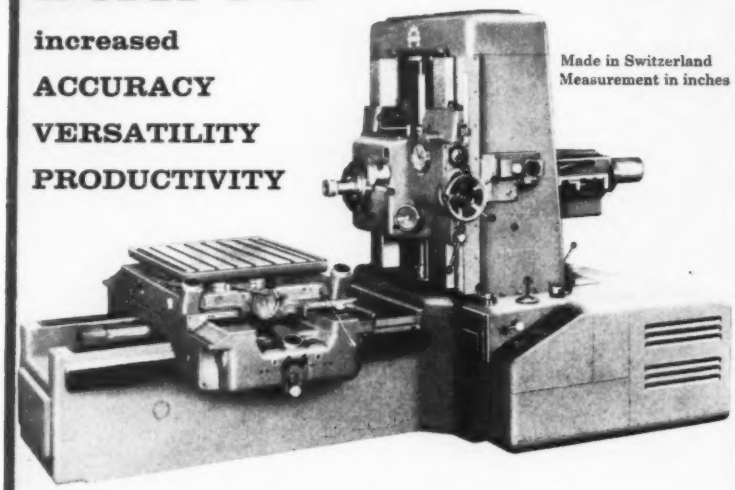
CUT ACCUMULATED ERRORS to a minimum

with the

DIXI 75 horizontal optical jig borer

increased
ACCURACY
VERSATILITY
PRODUCTIVITY

Made in Switzerland
Measurement in inches



- Automatic positioning can be changed instantly to manual operation
- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

MBI

M. B. I. EXPORT & IMPORT LTD.

475 Grand Concourse, Bronx 51, N. Y.

Swiss Accuracy plus U.S. Know-how

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

and rejects will be on the downtrend. It is essential, however, that management be prepared to support the quality control program, during the initial period, with vision extended toward the ultimate goal.

Statistical Quality Control

Modern quality control is unthinkable without the use of statistical analysis to production processes and inspection data. Rule of thumb and guesswork are an expensive substitute.

Statistical methods permit the expression of the variability of a production process in terms of a single, meaningful figure, such as "coefficient of variation." Probability predicts the normal pattern of variation to be expected from a particular type of production process. Then, when the process should begin to show actual variations in excess of this normal expectation, corrective action can be initiated immediately — sometimes even before a defective product makes its appearance. Going one step further, one may review the original blueprint tolerances of a product for compatibility with normal process variability and capability.

When it becomes necessary to perform sampling — such as inspection of incoming materials, stock in process or finished goods — a sampling plan can be worked out statistically, which will combine minimum inspection and testing labor consistent with the required assurance of correct decisions. The chance elements in sampling inspection is reduced to a minimum by application of the principles under which probability laws operate.

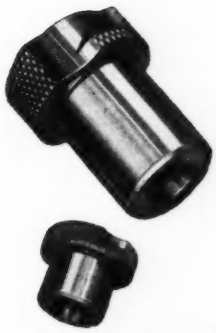
Missile reliability engineers work extensively with statistical tools of analysis in improving the accuracy and precision of production. Here, quality and reliability are the chief aim. But many firms desiring to maintain a standard quality at a relative minimum cost have turned to statistical quality control as the most practical and economical means of accomplishing these objectives.

. . . Continued on page 19

YOU'RE ON THE MONEY WITH UNIVERSAL DRILL BUSHINGS

222

In shop talk you're "on the money" with Universal drill bushings. You're "in the money" with savings, too. Universal drill bushings save tools because they have super finished bores, blended radii and 100% concentricity. They wear longer and are easier to change due to their knurled heads. All standard sizes and lengths available for immediate delivery.



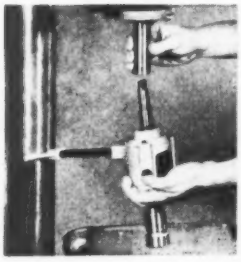
Write today for new catalog showing the complete line of Universal quality products.

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 8, MICHIGAN

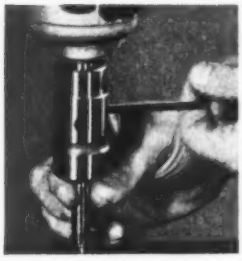
CIRCLE INFORM-A-GRAM KEY NO. 15

IT'S A FACT!

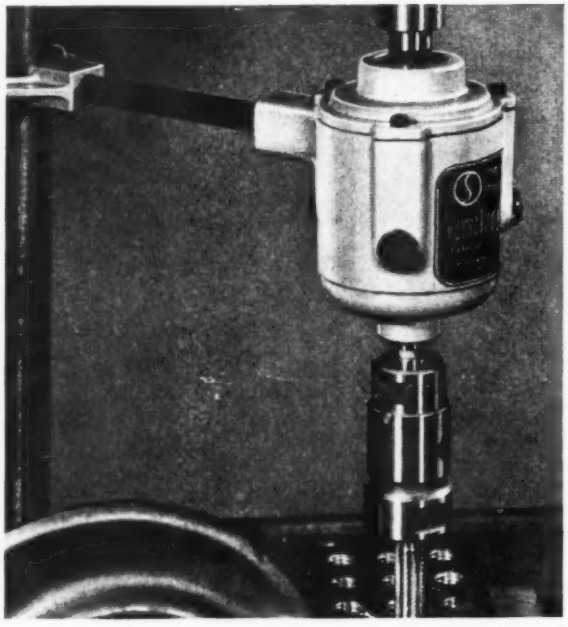
You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.



Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press . . . features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...
operates easily in any material
...with widest capacity range
...yet costs far less

JUST $63 COMPLETE

The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½", but depending on application, use of taps smaller than No. 10 is limited. It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

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PRODUCTS CORPORATION
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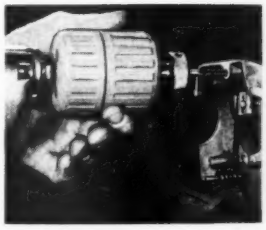
You get more from power tools with Top Quality Supreme Accessories

Supreme Brand Chucks

Noted for unmatched quality. The widest range of sizes and types...one for every machine in your shop. Exclusive Supreme hardening means greater accuracy—longer wear.

Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes—permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. *A fine tool.*



Supreme Push-Pull Tapper

Like the Versamatic, but made for the single purpose of tapping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16" diameter. Top quality. Simple to operate.

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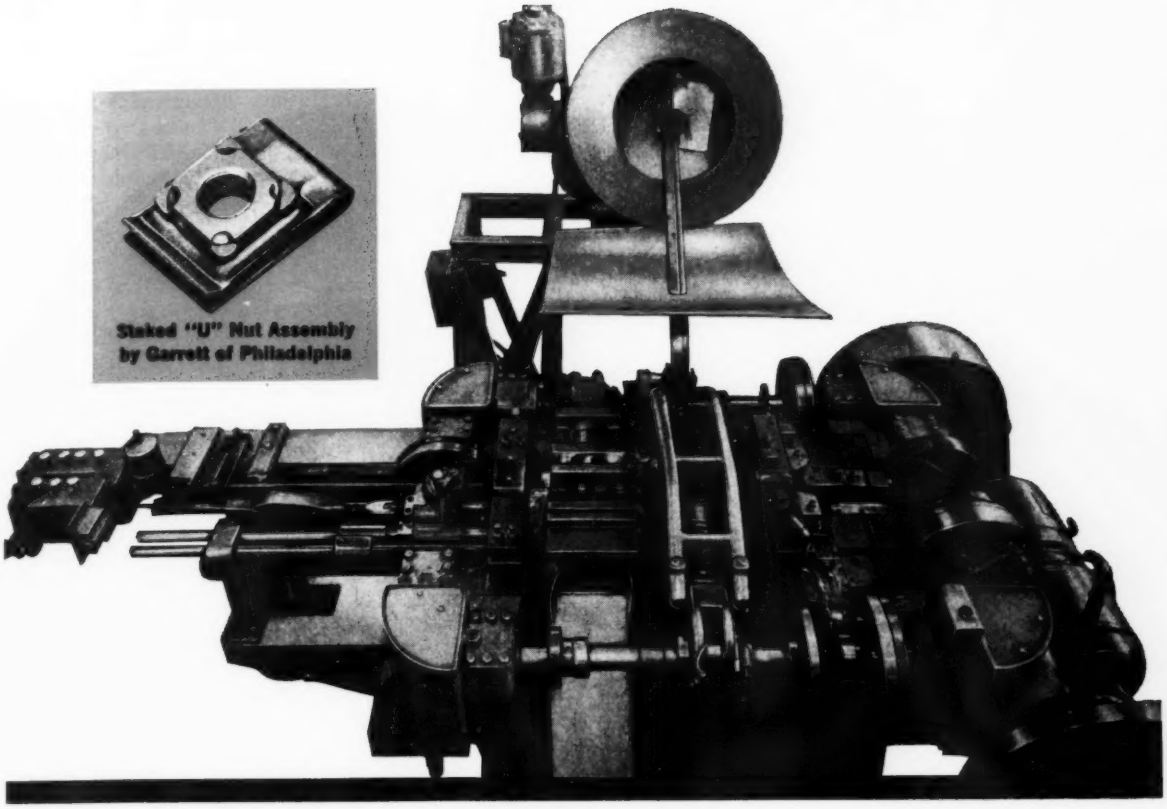
CIRCLE INFORM-A-GRAM KEY NO. 16

Staked "U" Nut Assembly by Garrett of Philadelphia



U.S. symmetrical Multi-Slide® produces staked "U" nut assemblies in one operation!

The No. 33 U. S. Symmetrical Multi-Slide shown above—one of the many in use by The George K. Garrett Company, Inc., of Philadelphia, is producing Garrett's Staked "U" Nut Assembly. Conventional production of this assembly requires 3 separate operations... stamping of blank, assembling and staking before forming, and finish forming.

Now, with the U. S. No. 33 Symmetrical Multi-Slide, the 3 operations are combined and performed by this one U. S. Multi-Slide—which produces complete, Staked "U" Nut Assemblies at the rate of 140 per minute.

This is another example of the cost reduction and time saving advantages U. S. Multi-Slides can and do make possible.

Write for full information on U. S. Multi-Slides —ask for Bulletin No. 15. P

MULTI-SLIDE

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 17

A STOCK LEMPCO DIE SET HELPED H. K. METALCRAFT DO THE "IMPOSSIBLE"!

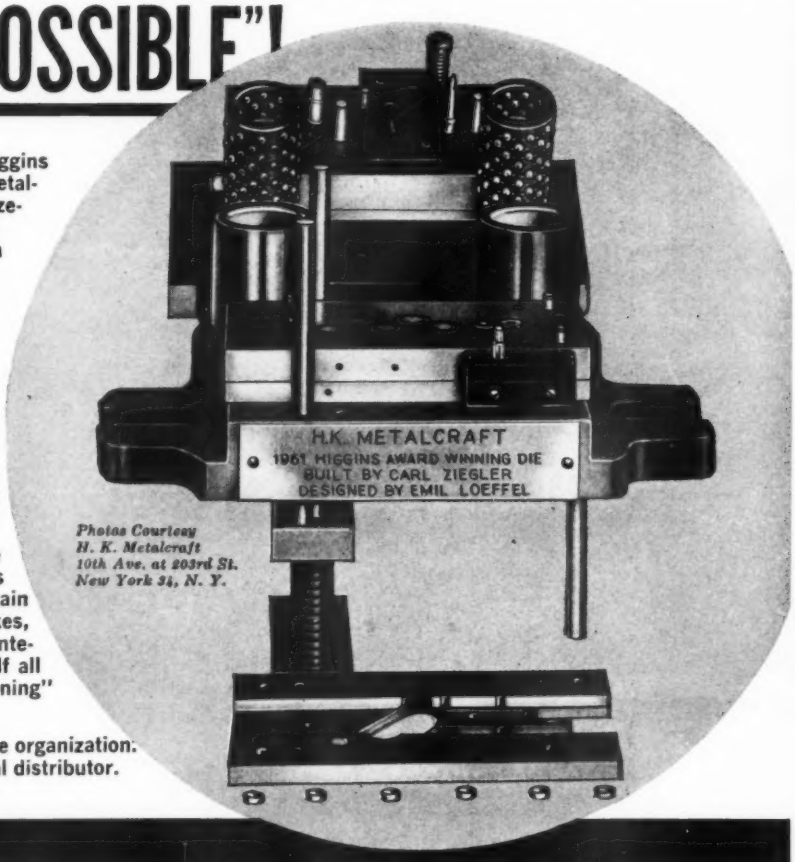
Winner of the John Woodman Higgins Award for 1961, Emil Loeffel, Metalcraft tool engineer, mounted his prize-winning dies in STOCK Lempco Die Sets, assembled to his order by a N. Y. City Lempco Distributor; see photos.

These dies produce, at $1.75 per thousand, a part which formerly cost $12 per thousand.

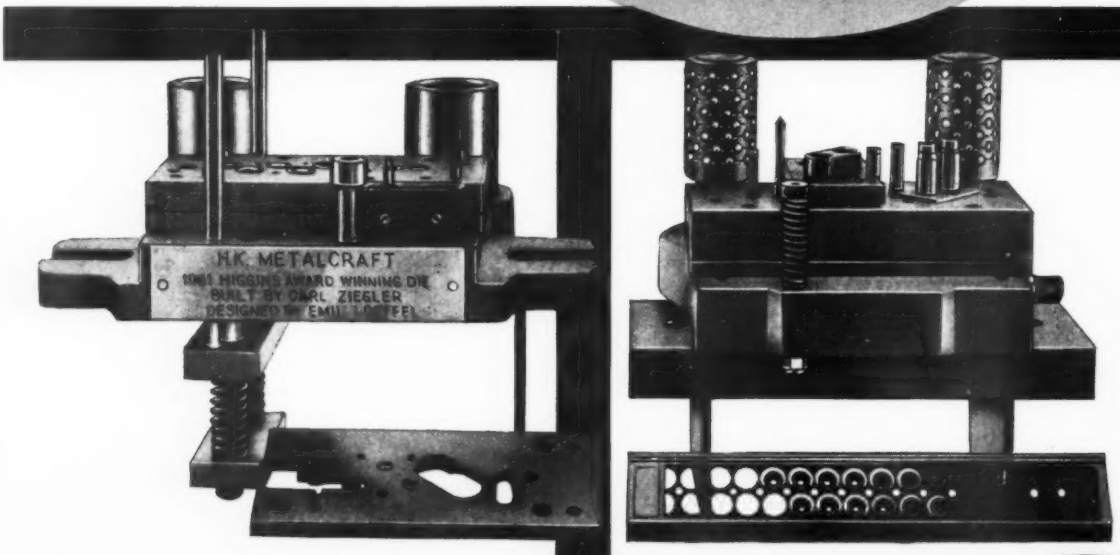
It was no accident that Lempco Die Sets were selected; Mr. Loeffel says he trusts their accuracy completely and adds, " . . . time saved in assembly and disassembly is very considerable".

Lempco Ball Bearing Precision Die Sets have long been known for this feature and for their ability to maintain exact alignment for millions of strokes, with an absolute minimum of maintenance. Why not find out for yourself all the advantages of using "prize-winning" die sets?

Lempco has a nation-wide warehouse organization. Write for literature and name of local distributor.



Photos Courtesy H. K. Metalcraft 10th Ave. at 203rd St. New York 34, N. Y.



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CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk from page 14

Benefits of Quality Control

A product of controlled quality, produced economically and efficiently, is the aim of a quality control program. There are many benefits that result from such a program, and we may now list these from a production standpoint.

First, by economical sampling and testing of incoming materials, you gain assurance that an unsatisfactory product does not go into production.

Next, by controlling product variations and quality within the allowable limits at each process operation, a smoother flow of production is achieved. For example, it takes only a few minutes to produce a tote box full of parts with die marks on the drop hammers, but it takes hours to remove those marks on a polishing lathe. If the bad work is not produced in the first place, the subsequent tie-up and extra cost is avoided.

Further, by reviewing inspection records, places are spotlighted where training of operators and workmen is needed, where machinery may require repair or replacement, where hidden machinery deficiencies may be causing quality trouble, and where design changes may be required.

Then also, as quality improves, rework, seconds and waste decrease. The cost of sorting good products from bad, being one of hidden inspection costs in many plants, practically disappears.

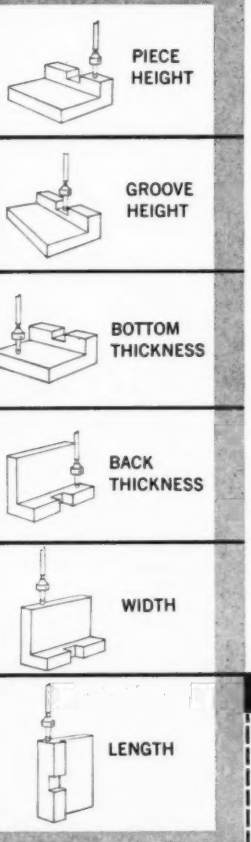
Finally, operator morale inevitably improves with improvements in quality and a smoother flow of production.

From a sales standpoint, there will be improved acceptance of the company's product as complaints, service calls and returns shrink. The best salesmen of your goods are the goods themselves. ■

THE INFORM-A-GRAM CARD IS FOR YOUR CONVENIENCE IN MAKING INQUIRY REGARDING ADVERTISED PRODUCTS AND EDITORIAL ARTICLES.

6

DIFFERENT MEASUREMENTS ON THIS PART IN LESS THAN A MINUTE!



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SINCE B&L 1853

Made in America, to the world's highest standards.

Fast? You bet your life . . . but that's only part of the story. Bausch & Lomb DR-25B Optical Gage gives you *direct* measurement to 0.0001" over a 3" range on a bright, magnified scale . . . to 0.000025" if required. Designed for shop use, no other instrument of this type, at any price, achieves such precision.

Fast, easy, accurate . . . and only $875! Put the DR-25B to work in your shop and start savings of up to 85% in gaging time (job-proved by Aeroquip Corp., Taber Instrument Corp. and many others.)

Distributed in U.S.A. through the DoALL Company.

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☐ I'd like an on-the-job demonstration of the DR-25B with no obligation.

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CIRCLE INFORM-A-GRAM KEY NO. 19

IT'S A FACT!

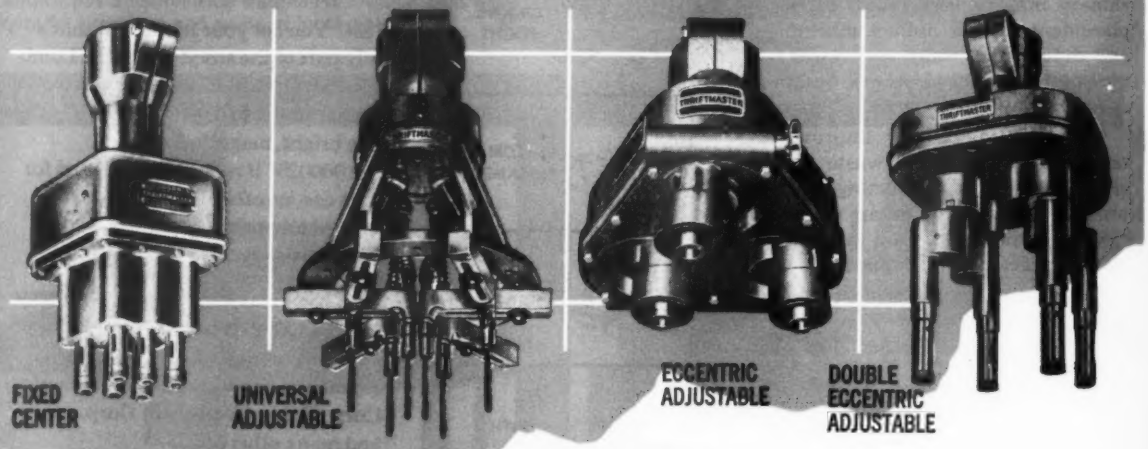
DRILLHEADS
ARE OBVIOUS.

Tremendous economies from the use of multiple-spindle drillheads are obvious. Drilling one hole at a time cannot be tolerated in this day of automation!

THOMSON
THRIFTMASTER
Drillheads
are your best Drillhead buy...

1. They are better built and cost no more (Full ball bearing construction, hardened gears, spindles and driver, and precision grinding!)
2. This means they last longer
3. This eliminates down time
4. This eliminates production losses
5. This drastically reduces drilling costs

THOMSON
THRIFTMASTER
Drillheads are designed and produced by engineers whose experience in this specific field dates back to 1923. This long accumulation of engineering technique and production "know-how" is reflected in our product—a quality tool... solid, substantial and dependable!



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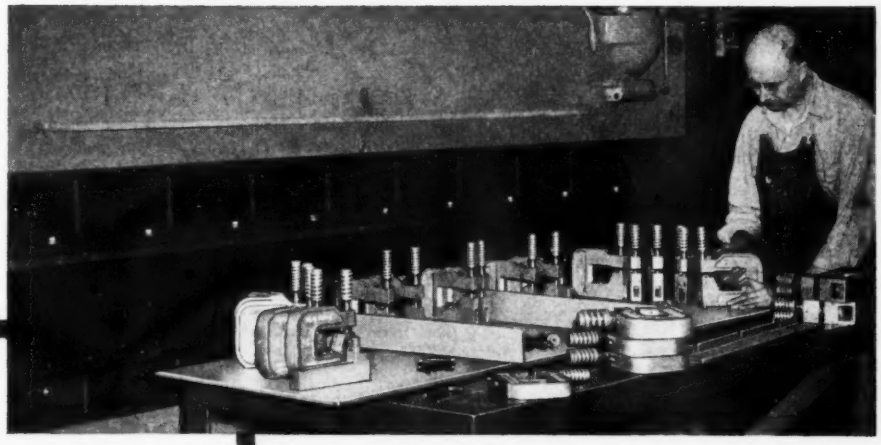
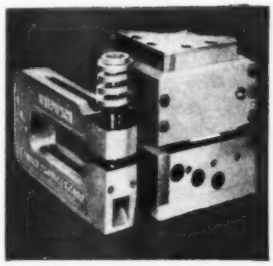
CIRCLE INFORM-A-GRAM KEY NO. 20

CUT PRESS DOWNTIME

UNIPUNCH® HOLE PUNCHING and NOTCHING UNITS

Unipunch Hole Punching Units being setup on template outside press brake. No press downtime. Complete setup is simply placed on press bed and production starts immediately.

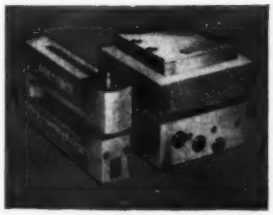




Series "A" Hole Punching and Notching Units

MAX. METAL THICKNESS ¼"

OFF-SHELF DELIVERY ON COMPLETE LINE OF UNITS and PARTS



Series "B" Hole Punching and Notching Units

MAX. METAL THICKNESS ⅛"

IMMEDIATE DELIVERY ON COMPLETE UNITS and ALL COMPONENTS

Assemblying complete Unipunch setups outside presses and press brakes eliminates press downtime. Setups are interchanged on press beds and production starts with first stroke of ram . . . no adjustments or aligning . . . presses are kept in continuous production.

CUSTOM SETUPS WITH STANDARD UNITS

Unipunch Tooling System produces custom hole punching and notching setups with standard, self-contained units that permanently align punches and dies...*nothing attached to press ram.* Unipunch Hole Punching and Notching Units are used and reused in unlimited setups... *no "dead" non-productive* storage.

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CIRCLE INFORM-A-GRAM KEY NO. 21

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THRIFTMASTER

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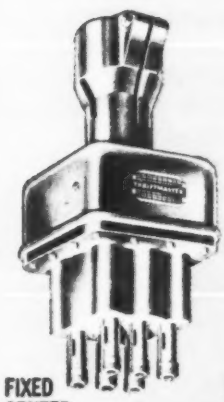

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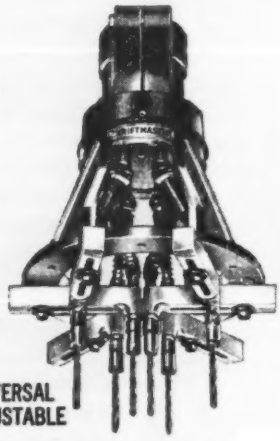
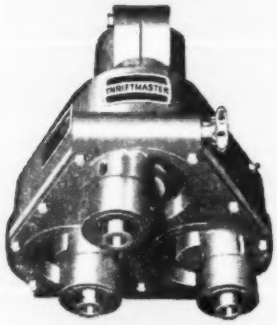
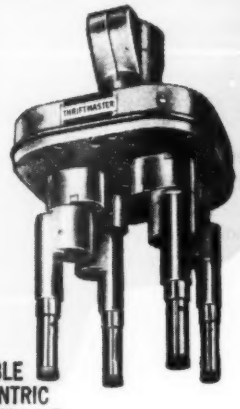


UNIVERSAL ADJUSTABLE



ECCENTRIC ADJUSTABLE



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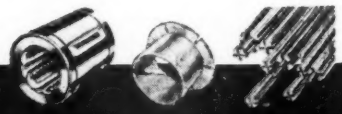

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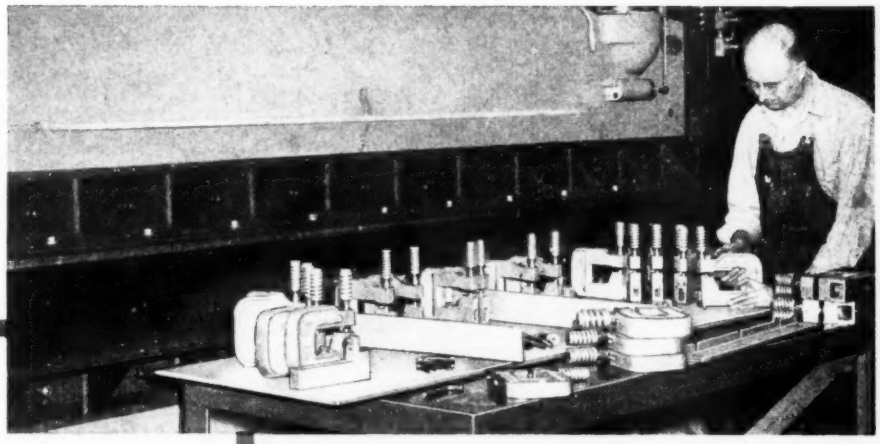
CIRCLE INFORM-A-GRAM KEY NO. 20

CUT PRESS DOWNTIME

UNIPUNCH® HOLE PUNCHING and NOTCHING UNITS



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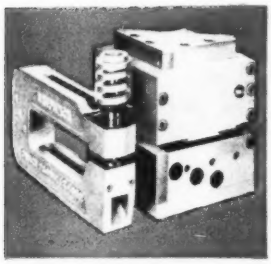

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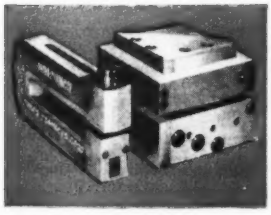

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Assemblying complete Unipunch setups outside presses and press brakes eliminates press downtime. Setups are interchanged on press beds and production starts with first stroke of ram . . . no adjustments or aligning . . . presses are kept in continuous production.

CUSTOM SETUPS WITH STANDARD UNITS

Unipunch Tooling System produces custom hole punching and notching setups with standard, self-contained units that permanently align punches and dies . . . *nothing attached to press ram.* Unipunch Hole Punching and Notching Units are used and re-used in unlimited setups . . . *no "dead" non-productive* storage.

Start fabricating sheet metal parts NOW with the *latest time-saving and money-saving method* . . . Unipunch Tooling System.

For the Hole Story . . . Write for **FREE** *Data Book "S"*

UNIPUNCH®

PUNCH PRODUCTS Corporation

374 BABCOCK ST., BUFFALO 6, N. Y.

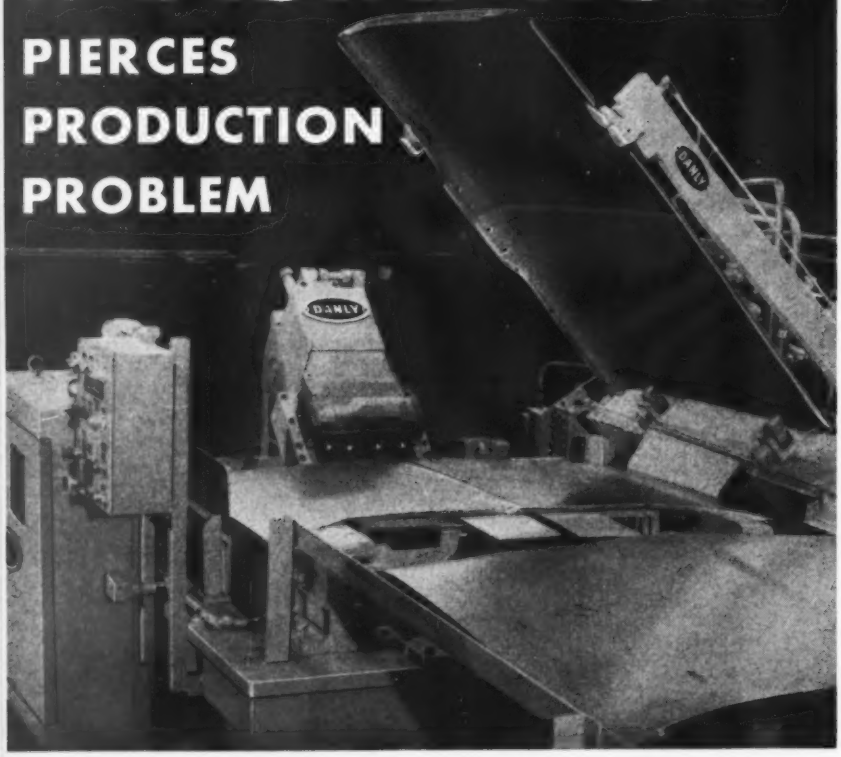
Exclusive Canadian Licensee: WM. F. BEATTIE ASSOCIATES, HAMILTON, ONTARIO

CIRCLE INFORM-A-GRAM KEY NO 21

DANLY

IMAGINATION

PIERCES PRODUCTION PROBLEM



This Hydraulic Piercing and Turnover Unit, designed and built by Danly for a major automobile manufacturer, automatically pierces ornament mounting holes in hoods as they come off the forming press. And it handles 600 hoods per hour! Then it turns them over for the next operation. Versatile! Practical, too—because it eliminates the need of a press for piercing and a separate turnover unit. Typical of the Danly engineering that applies hydraulics and imagination to speed production and cut costs.

Danly's complete line of Hydraulic Platen Presses and hydraulic cylinders offers you the tools to solve virtually any compression molding, bonding, laminating, trimming, extruding or piercing problem in processing metal, plastics, or rubber. They're precision units with accurately machined platen faces, positive parallel platen closure, uniform pressure distribution and extra, rigid strength. And Danly's versatile engineering adapts these tools to *your specific needs.*

DANLY®

HYDRAULIC PRESS CATALOG shows all the features, sizes, adaptations—all the reasons why you should invest in a Danly. Write for your copy.

Mechanical Presses, Die Sets, Diemakers' Supplies, Hydraulic Metalworking Equipment

DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 South Laramie Ave., Chicago 50, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 22

Co-op Job Plan

Bidding on manufacturers' subcontracted jobs and government work has gone scientific. A nationwide membership plan, the first of its kind in metalworking, lets member companies compete on a cost, quality and performance basis with the country's major machine shops.

The formation of Manufacturing & Machining Services Corp. gives member companies a chance to share a national sales organization with offices in all major industrial centers. George D. Kaplan, author of the plan and president, states that a continuously current catalog of member shop facilities is kept, allowing for realistic matching of bidding opportunities to contract requirements. A record of job loads in all shops is also maintained. This limits bidding to those who can meet production deadlines. A minimum of at least three member firms will be given opportunity to bid on each project.

Powerful Punch

It has a 10,000 amp capacity, and packs enough punch to dissolve a record 60 cu in of metal/hr in electrolytic cavity sinking or grinding operations.

This new power supply unit joins the Anocut family at more than triple the amperage of its predecessors. Anocut Engineering Co., 631 West Washington Blvd., Chicago 6, Ill. claims that this is by far the fastest electrolytic equipment ever built. The new unit is housed in a triple-size cabinet 72″ tall, 120″ wide and 50″ deep. It contains more than four tons of electrical components, such as silicon rectifiers, saturable core reactors, and a multiple wound transformer.

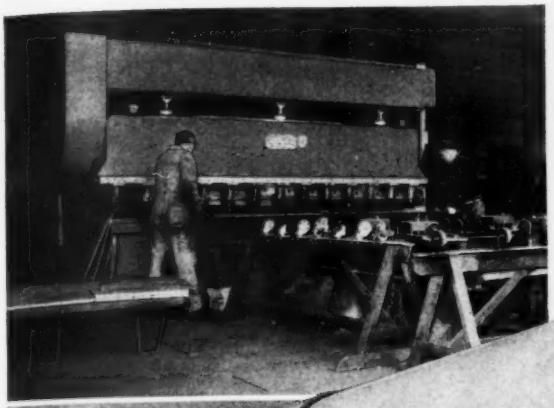
The power supply unit includes the Anocut electronic voltage computer. For accurate control of metal removal, the computer automatically monitors and adjusts voltage to maintain top removal speed without producing sparks. At the same time it filters out unwanted voltage fluctuations, so that smooth finishes can be maintained.

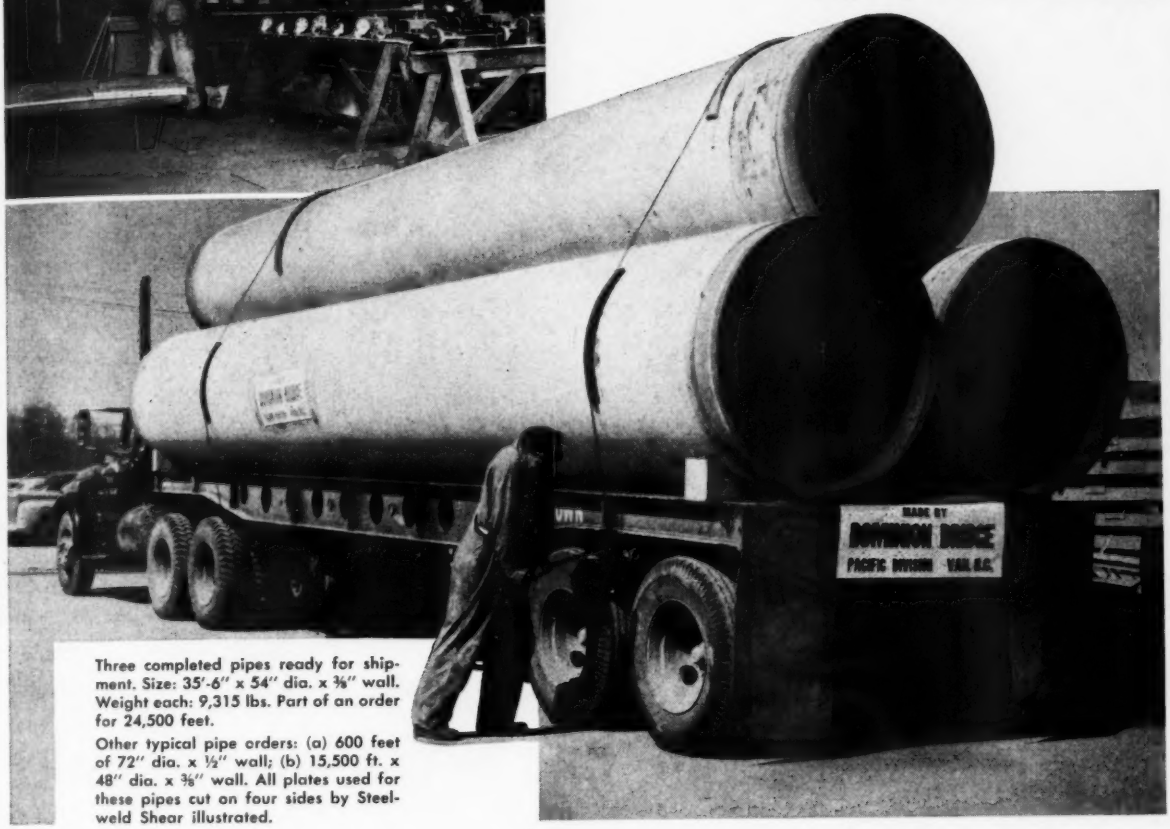
The company offers Bulletin B-1, or circle No. E1.

CUTS MILLIONS OF FEET OF STEEL SQUARE and ACCURATE

Steelweld Shear Speeds Big Pipe Line Shearing

This shear cuts pipe line plate accurately. It has been doing so for years with only minimum maintenance.





Three completed pipes ready for shipment. Size: 35'-6" x 54" dia. x ⅜" wall. Weight each: 9,315 lbs. Part of an order for 24,500 feet.

Other typical pipe orders: (a) 600 feet of 72" dia. x ½" wall; (b) 15,500 ft. x 48" dia. x ⅜" wall. All plates used for these pipes cut on four sides by Steelweld Shear illustrated.

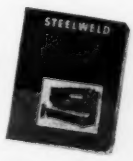
Dominion Bridge Company, Ltd., is the largest steel fabricating concern in Canada. Among its many activities is that of making steel pipe for Canadian pipe lines. At its Pacific Division, Vancouver, B. C., pipe is made in various diameters, mostly 3'-0" to 5'-0", and usually in lengths of 35'-0" to 40'-0". Pipe walls generally range from ¼" to ½".

One typical order called for 35 miles of 36" pipe in 40'-0" lengths with ¼" and 5/16" walls. This required 10,000 tons of steel. Five to seven plates were used for each pipe. Each plate was cut on all four sides to assure accuracy and squareness required for perfect fitting. Over a million feet of steel was sheared for this job — all on one Steelweld Shear.

The machine worked 15 hours a day, cutting 12,000 to 14,000 feet. The knives needed turning to a sharp corner every 2 to 2½ months, which meant that only after 8 to 10 months of continuous production shearing was regrinding necessary.

Heavy construction of the shear, Steelweld's own air-operated clutch, easy knife adjustment to suit metal thickness, and electric foot switch control, are some of the factors contributing to the success of Steelwelds on hard service jobs.

Write for Catalog No. 2011



STEELWELD

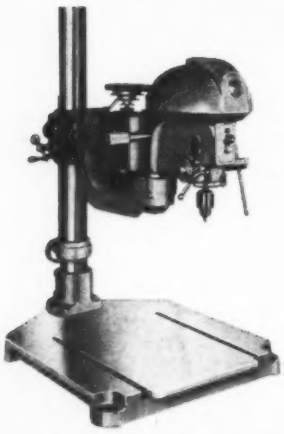
PIVOTED BLADE *Mechanical and Hydraulic* **SHEARS**

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

STEELWELD MACHINERY DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 8763 282 ST. • WICKLIFFE, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 23

Position the tool—not the work with this new Delta Unidrill*



New Delta Unidrill line is available in bench and floor models or as components for custom assembly. Choose Utility or Deluxe Head, High or Slo Speed, Key Chuck or Tapered Spindle.

FREE BROCHURE catalogs full Radial Drill Press line. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 622L N. Lexington Ave., Pittsburgh 8, Pa.

It's the unique double-swivel design that gives this new 2-foot arm radial drill press such big job capacity—in metal or wood. You can do more jobs faster and easier because you can move and tilt the drill head—position the cutting tool to the work in five different ways! This saves the cost of expensive jigs and cuts time-consuming shifting of the work.

You can drill to the center of a 48" circle—on or off the table. And with six interchangeable spindles or spindle adapters, you can change in seconds to handle reaming or spot facing of metal, routing or planing of wood, and many other jobs.

The only way to see how the Unidrill can solve *your* drilling problem is to see this flexibility in *action*. Your Delta Industrial Distributor (under TOOLS or MACHINES in the Yellow Pages) will gladly demonstrate. Call him.

**Trademark*

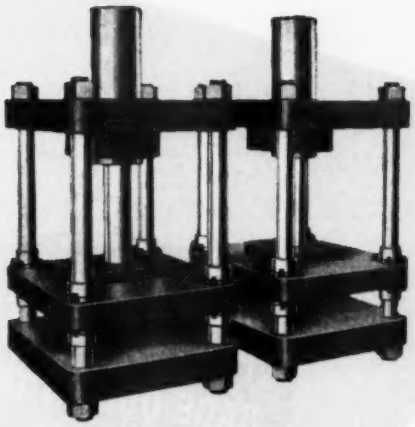
DELTA INDUSTRIAL TOOLS

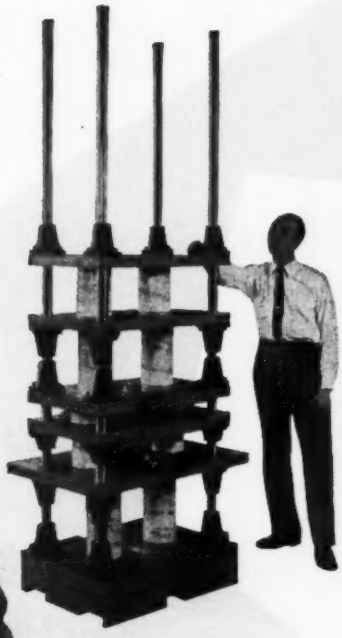
another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 24

Do you have a special die set problem?

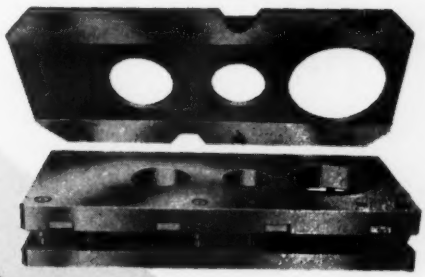




Producto can help you solve it. Special die sets can be large or small—weigh tons or a few pounds; they may be of steel plate, or castings; two-plate or multi-plate.

Often, they can be ordered directly from Producto's catalog. We regularly machine our "catalog specials" to meet your individual requirements. And, when you need a radically different, one-of-a-kind die set—call us. Our 35 years of die set manufacturing experience are yours for the asking.

Just call your nearby Producto distributor, or our manufacturing plants in Bridgeport or Detroit.



PRODUCTO

DIE SET DIVISION
THE PRODUCTO MACHINE COMPANY
945 Housatonic Avenue, Bridgeport 1, Connecticut

PRODUCTO

DIE SETS & ACCESSORIES • PUNCHES & DIES • TOOLROOM EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 25

THE PIPE MACHINERY COMPANY

MANUFACTURERS OF

PIPE FINISHING MACHINERY, (THREADING-FACING) AUTOMATIC HANDLING TABLES
A.P.I. RECEDING DIES & TAPS, CHASERS AND CUTTING TOOLS
GAGES, (STANDARD AND SPECIAL)

QUOT

29100 LAKELAND
WICKLIFFE, C

Date June 14, 196

To Martin & Hay In
4692 Maine
Chicago, I

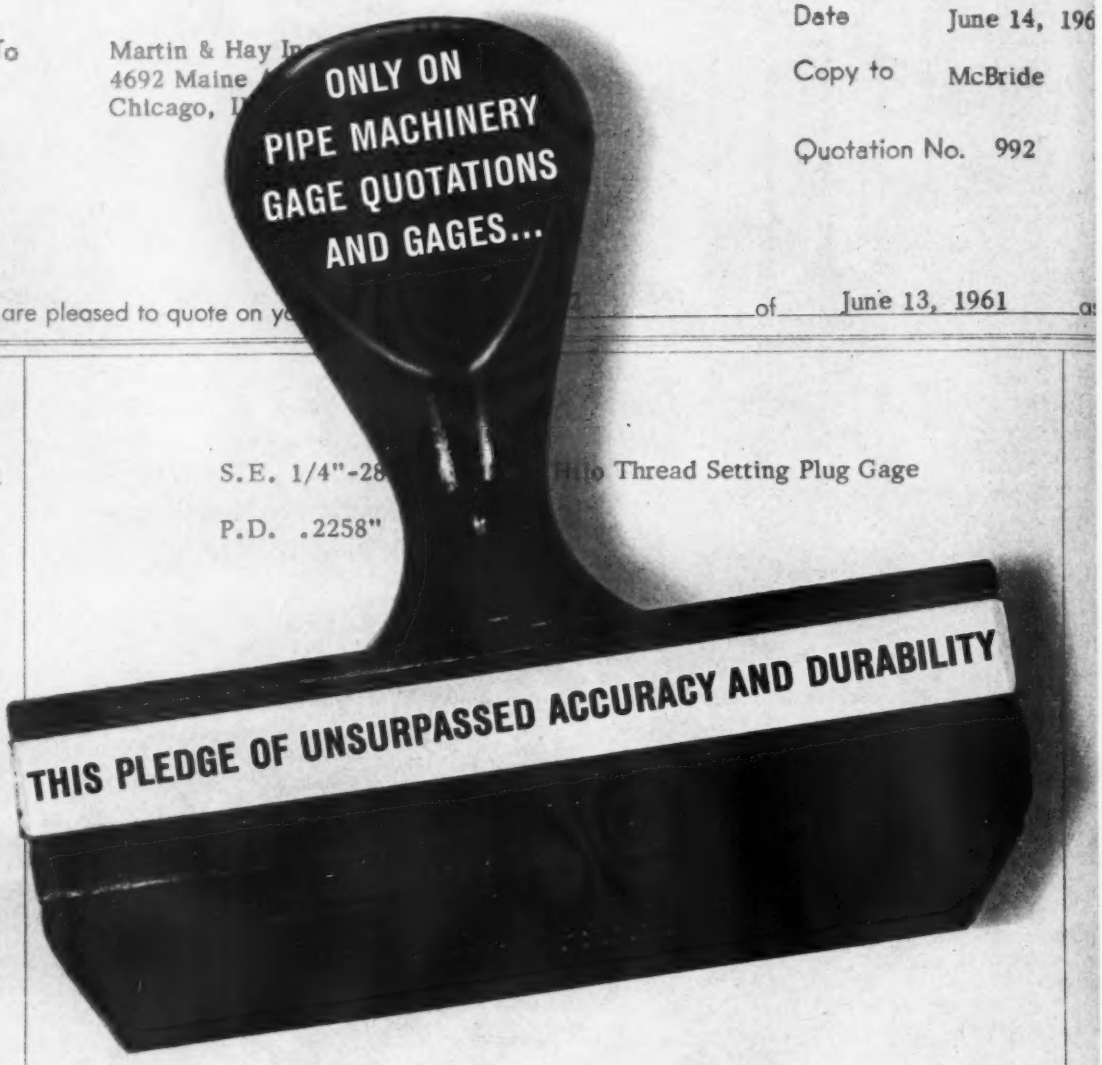
Copy to McBride

Quotation No. 992

We are pleased to quote on y of June 13, 1961 a

1 S.E. 1/4"-28 Thread Setting Plug Gage

P.D. .2258"



"Gages quoted on basis of furnishing rings lapped with a plug lap, and plugs lapped with a ring lap, to remove soft grinding skin, fat end thread, drunken thread, grinding chatter, and to produce a low micro finish. This operation is necessary to insure gage accuracy and long life. All gages will be stabilized by deep freezing to insure dimensional stability.

Lead error, including drunkenness, shall not be greater than lead tolerance shown in H-28 handbook."

For further details on our complete line of high quality gages write us on your company letterhead today.

THE PIPE MACHINERY COMPANY • 29100 Lakeland Boulevard • Wickliffe, Ohio • Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 26

Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO

DENISON HydrOILics

How **AUTOMATIC ELECTRIC** assembles critical phone parts on **DENISON** Multipress via high precision...

SPINNING

HIGH PRECISION SPINNING *required for final assembly of delicate telephone receiver parts is done within specified tolerance of .001" on this Series "R" Denison Multipress in new Clean Room at Automatic Electric, Northlake, Ill. Write for free Bulletin 324–new "R-S-T" Series Multipress.*

FINAL ASSEMBLY of the vital operating components in Automatic Electric's new type 810 telephone receiver calls for an ultra-clean assembly area . . . *plus precision presswork to tolerances of .001".*

This Denison hydraulic Multipress is one of three Series "R" 8-ton Multipresses installed by Automatic Electric to handle key assembly operations in their new Clean Room.

Equipped with a special spinning die, this Multipress spins the telephone receiver shell-terminal board assembly to a frame-retaining ring assembly . . . joins these fragile parts in an airtight seal against dirt and moisture. Smooth, precisely controlled hydraulic ram pressure—an inherent performance feature of *every* Multipress—permits a positive, hermetically sealed closure with no damage to the delicate receiver components.

Do you have a pressing problem? Ask your nearby Denison Production Specialist about a **M**ultipress **A**nalysis **P**rogram in your plant. He'll help you **MAP** new ways to cut time and costs... improve quality on your toughest production jobs.

DENISON ENGINEERING DIVISION
American Brake Shoe Co.
1197 DUBLIN ROAD • COLUMBUS 16, OHIO

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

DENISON
HYDRAULIC MULTIPRESS

CIRCLE INFORM-A-GRAM KEY NO. 27

QUOT

THE PIPE MACHINERY COMPANY

MANUFACTURERS OF

PIPE FINISHING MACHINERY, (THREADING, FACING, AUTOMATIC HANDLING TABLES A.P.I. RECEDING DIES & TAPS, CHASERS AND CUTTING TOOLS GAGES, (STANDARD AND SPECIAL)

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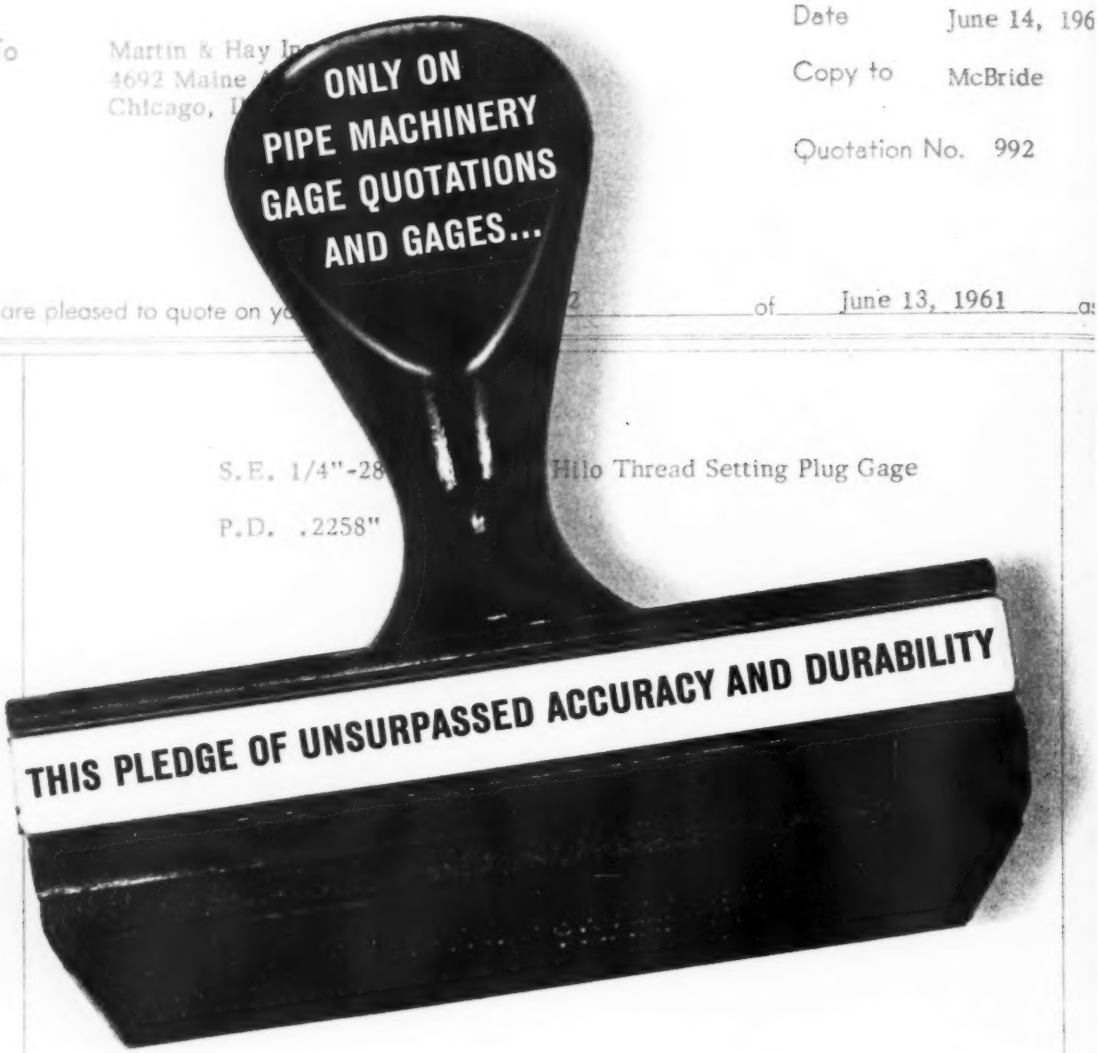

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DENISON ENGINEERING DIVISION
American Brake Shoe Co.
1197 DUBLIN ROAD • COLUMBUS 16, OHIO

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

DENISON
HYDRAULIC MULTIPRESS

CIRCLE INFORM-A-GRAM KEY NO. 27

The NILSON Combination Press and FOURSLIDE Forming Machine comes in seven models with press capacities from 5 to 75 Tons.

Part formed in one operation in a FOURSLIDE.

Competitive Pressrooms Can Produce and Earn More—with a Nilson FOURSLIDE

The NILSON machine, which combines a crank or toggle press with FOURSLIDE forming motions, produces complex stampings in one operation. Standard NILSON FOURSLIDES incorporate built-in stock straightening and feeding mechanisms, together with cam-actuated horizontal and vertical motions, providing many production advantages:

- Eliminate expensive camming and tooling
- Reduce material costs—no carrier for metal strip
- High production rates—up to 200 parts/minute
- Quick-change cams for fast changeover
- Utilizes lower cost adjustable form tools and dies for multiple sizes
- Automatic scrap disposal in the horizontal press
- Additional motions readily available from four camshafts
- Also handles wire forms requiring press operations
- Forms wide range of part sizes—up to 4" wide; 16" long
- Forms on two levels, and minimizes stripping problems

NILSON

Full explanation of the NILSON FOURSLIDE PROCESS is available in the "FOURSLIDE Design & Tooling Handbook", which is yours for the asking.

THE A. H. NILSON MACHINE CO. • 628 Bridgeport Avenue • Shelton, Connecticut

CIRCLE INFORM-A-GRAM KEY NO 28

WELDON

New... 2½" SHANK

EXTRA HEAVY DUTY END MILLS and HOLDERS

Rugged Dependability for your Toughest Jobs

OVER 40 YEARS OF LEADERSHIP SINCE 1918

A complete line...

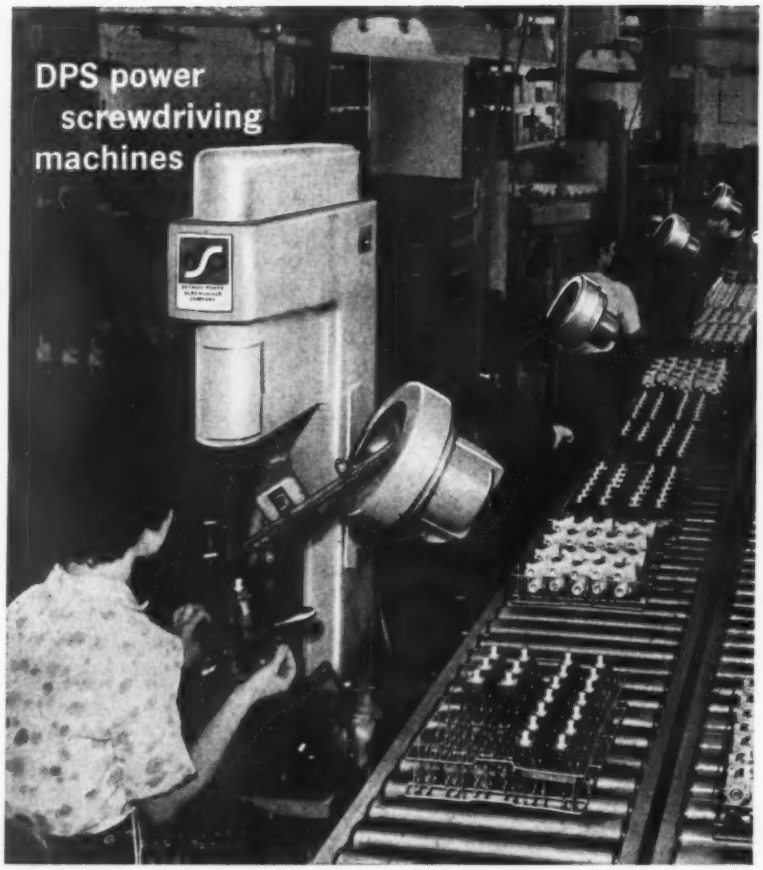
- 2½" diameter shanks
- 3" diameter of cut
- 12" length of cut

Write for more details

THE WELDON TOOL COMPANY

3000 Woodhill Road • Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 29



drive screws and nuts fast . . .
mar-free and accurately

Something as small as an inaccurately driven screw or nut can cause parts to be rejected. And that costs you money both in parts waste and time lost.

DPS Model U power screwdriving machines drive screws and nuts with the accuracy that improves assembly quality, reduces rejects. They give you speed, too. Drive up to 40 screws or nuts per minute.

The Model U is available in two types . . . pedestal and self-contained driving head. Both require only a minimum of space and are easily adaptable to your work flow. Feeder mounts on either side of machine column for right- or left-hand assembly. Other features include a positive control clutch which maintains constant driving torque, motorized hopper drive with safety clutch, and fully adjustable feed track and escapement mechanism.

DPS Model U drives screws from #6 x 3/16" long to 1/4" x 1 1/2" long and can be equipped with 12" or 16" rotary feeders. Write for Model U bulletin.

15,803

DETROIT POWER SCREWDRIVER CO.
A Subsidiary of Link-Belt Company

Selective Parts Feeders; Screw, Nut and Stud Driving Machines; Special Purpose Assembly Machines

2827 W. Fort Street
Detroit 16, Michigan
TAshmoo 5-3070

CIRCLE INFORM-A-GRAM KEY NO. 30

New Home for ASME

The American Society of Mechanical Engineers has a new home. The 50,000-member body now occupies the fifth, sixth and seventh floors of the recently-completed United Engineering Center at 345 E. 47th St., New York 17, N.Y.

Besides ASME's headquarters staff of 140, the new building will house 18 other engineering societies, all of them non-profit groups.

According to ASME President William H. Byrne, the move to new headquarters will provide the dual advantages of adequate office space and facilities to accommodate the ever-growing Society's activities, plus closer association with similar organizations.

NMTBA Urges Modernization

The National Machine Tool Builders' Assn. has undertaken a "grass roots" program to educate the American public to the need for plant modernization. A bulletin attached to the recently-published revised edition of the body's publication, *Machine Tools Today*, calls on members to distribute this timely issue as widely as possible.

The bulletin reads in part: "We recommend that every member make a special patriotic project of listing key people within his area, including members of Congress and state governments, and send them a copy of *Machine Tools Today* with a covering letter. We recommend this action in addition to your usual distribution to plant visitors, students and educators in engineering colleges, technical high schools . . ."

The revised issue is described as being "written in non-technical language and liberally illustrated," and showing "how progress has been made in increasing productivity by building 'intelligence' into machine tools, as with numerical control; . . . how new metal-removing techniques have been introduced, and how progress has been made in shaping hard materials which are becoming so important in the pressure for ultra-precise machine tools."

FANTASTIC!

production results and savings...

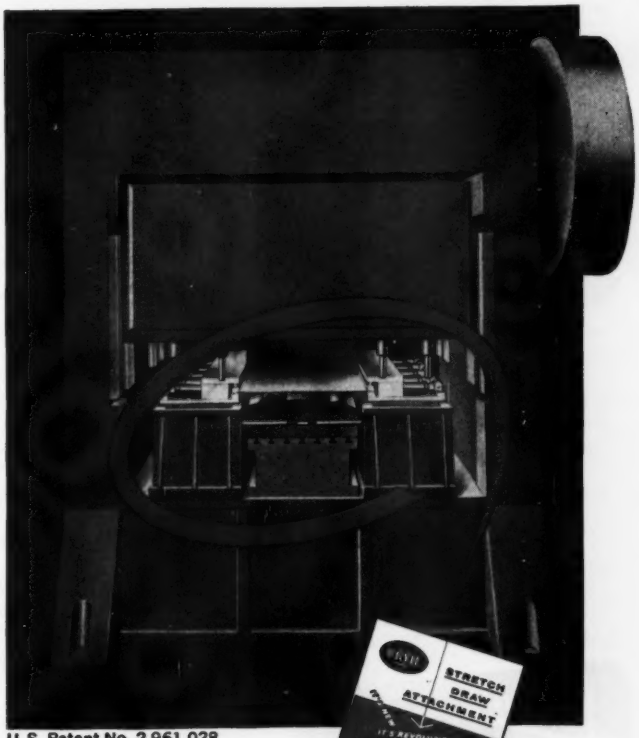
These 36" x 84" parts were formed minutes apart by simply adjusting hydraulic pressure.
(Photos courtesy of Penton Pub. Co.)

SHAPES...THAT HOLD THEIR SHAPES...

FANTASTIC is often an over used adjective, but definitely not in this case . . . Here are the facts, you be the judge!

The new BATH Tension Controlled Blank Holder can save the manufacturer of shallow draw parts over **sixty** percent in die costs and **twenty** percent in material costs . . . and the pay-off . . . deliver a better part. Stretching the metal just prior to forming makes the metal "flowable" or "plastic-like" . . . result . . . no oil canning, no wrinkles. Shallow draw parts that required a 1,000 ton press can now be produced on a 100 ton press. Part spring back is practically eliminated. If you heat treat, coat or enamel your parts, they will still hold their shape . . . in short, SHAPES THAT HOLD THEIR SHAPE.

FANTASTIC . . . it could well be just that in your future forming cost picture. Full details are available on this completely NEW process.



U.S. Patent No. 2,961,028

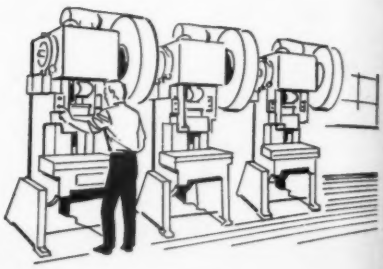
THE CYRIL BATH COMPANY

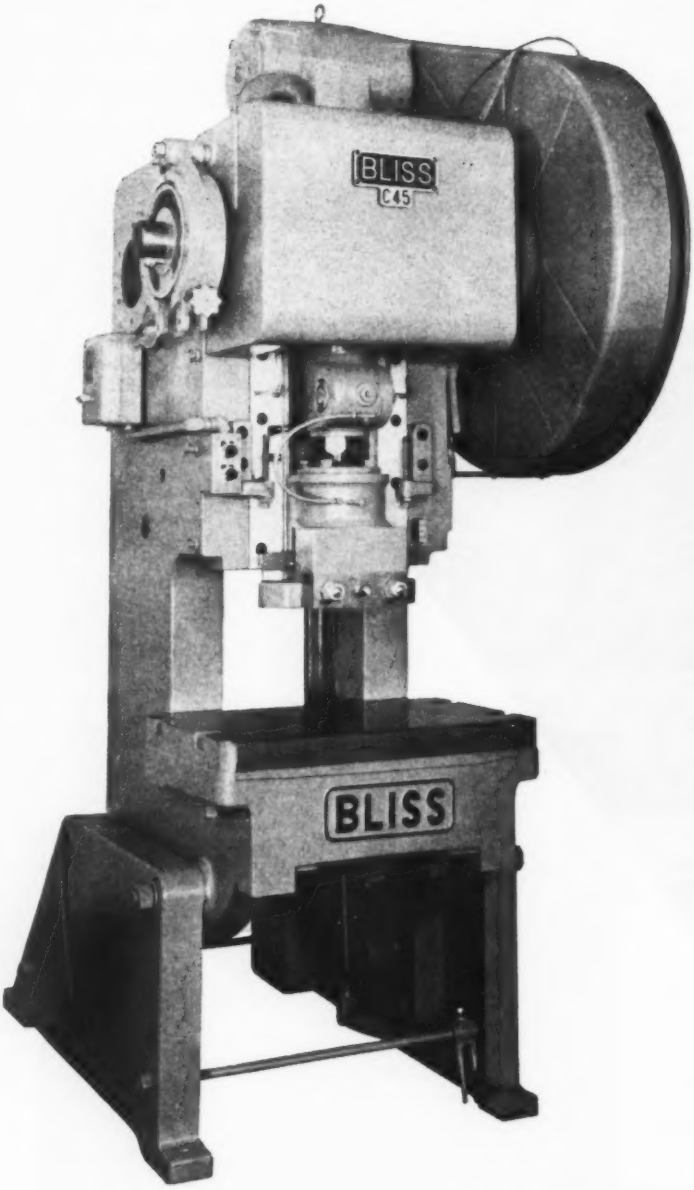
32370 Aurora Road • Cleveland 39, Ohio
(LOCATED IN THE GREATER CLEVELAND AREA)
Manufacturers of Radial Draw Formers • Dies • Tools
Press Brakes • Tangent Bending Sequence Presses • Press
Type Brakes • Special Machines

WRITE, WIRE OR PHONE FOR LITERATURE.

CIRCLE INFORM-A-GRAM KEY NO. 31

ANOTHER SATISFIED USER





LAMINA-BRONZE WEAR PLATES

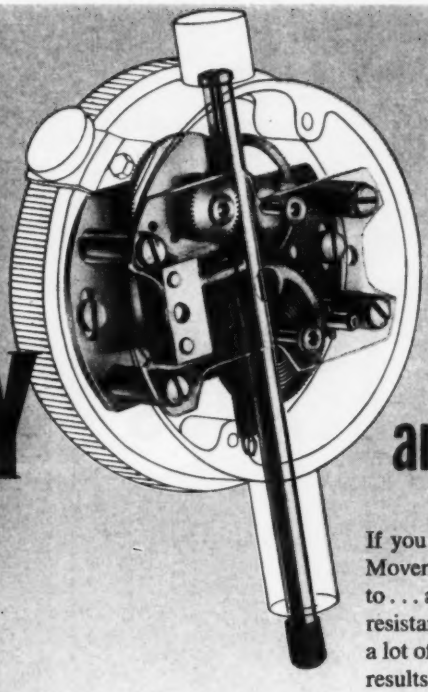
Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN
Phone JOrdan 6-8711

Lamina-Bronze Wear Plates and their use are more completely described in Bulletin WP-59, send for your free copy.

The ram guides of this Bliss press utilize Lamina-Bronze (electroplated bronze on steel) wear plates to assure long life and free-running. For all models in the "C" series of inclinable presses, Bliss has standardized on Lamina-Bronze V-Gibs. In like manner, Lamina-Bronze wear surfaces are the best answer for any part that requires the non-seizing properties of bronze and the strength of steel.

CIRCLE INFORM-A-GRAM KEY NO. 32

ALL VERY HAPPY and You'll be, too!



WITH THE MIRACLE MOVEMENT DIAL INDICATOR

If you haven't yet discovered the Federal Miracle Movement Indicator, you have a lot to look forward to . . . as these users point out below. Its *unmatched* resistance to wear and to shock is saving money for a lot of people. Why not join them and enjoy better results than with the indicator you are now using? You will, . . . take *their* word for it!

Drastically Reduced Maintenance Costs

"We have been ordering Federal Miracle Movement Indicators for some time now, and estimate that they comprise about 50% of all the Federal Dial Indicators we have in use at the present time. Our maintenance records show, however, that the Miracle Movement Indicators comprise less than 4.3% of those needing repair. This certainly indicates an outstanding increase in the durability of your product."

The American Welding & Manufacturing Co., Warren, Ohio

Outlasts Them All

"One of our inspection jobs . . . checking the split line height of sleeve bearings . . . is a tough application for the dial indicators because they are mounted on a hydraulic ram and are subjected to heavy impact each time the ram is actuated. Federal Miracle Movement Indicators are doing this difficult job very satisfactorily at an average maintenance cost of approximately $3.00 per indicator of which only 10% is for replacement parts! With other makes, repair costs usually run about 6 or 7 times as much per indicator."

McQuay-Norris Manufacturing Co. Indianapolis, Indiana

Greater Accuracy for OEM Products

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Pressure-positive De-Sta-Co Clamp provides stability while lenses are cemented to light housings.

A MODEL FOR EVERY APPLICATION

Whatever needs to be held securely—by forces of fractions of pounds or multiple of tons—you can have absolute control with a De-Sta-Co clamp. Miniature models are available for extra light jobs—rugged, hefty models for heavy duty jobs—plunger action models for push or pull jobs—air-hydraulic operated models for multiple, split-second remote control operation. Select the model to fit the job, controlled holding power is yours, with De-Sta-Co.

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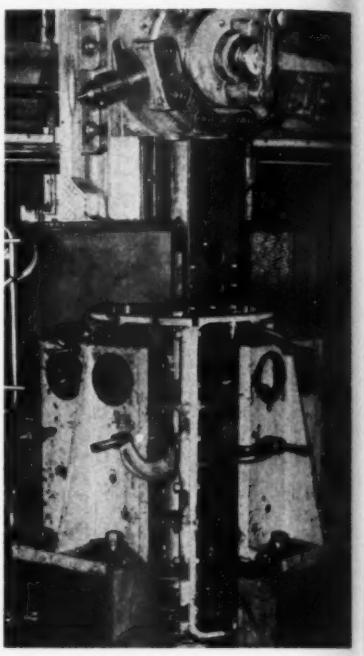
CIRCLE INFORM-A-GRAM KEY NO. 34

50 Tool Changes Can Be Boring

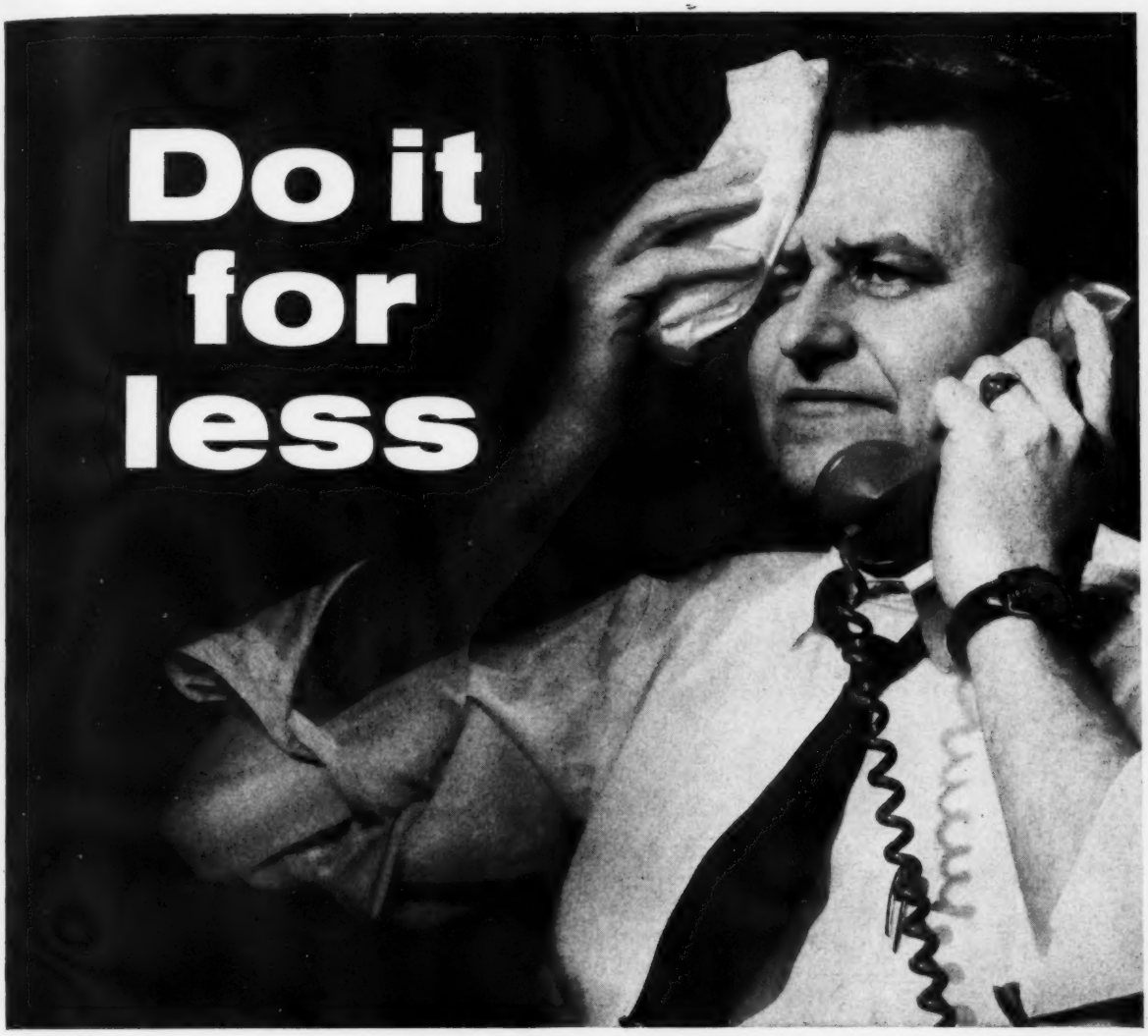
An east coast machine shop used to make more than 50 tool changes with the best original tooling to complete a single casting. This included various carbide grades in brazed tip tools. Machining a 16.300 dia bore in a cylindrical, relatively delicate, frame-like stainless steel casting of 20" OD cost too much in time and tools, until the right tool and grade of carbide inserts were obtained.



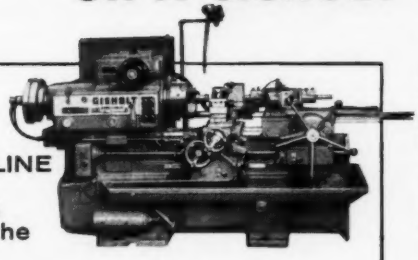
Machining time was reduced to one-third with brazed tip tools, and tool life was extended 50 times by square indexable throw-away inserts of Kennametal Grade K1 from Kennametal, Inc., Latrobe, Pa. in a style D positive-rake toolholder.

These K1 inserts offer increased length of rough boring from 2 to 14" per cutting edge. The toolholder of special design permits cutting in both directions.

Boring on the Type 304 stainless casting consists of four rough passes with ⅛" depth of cut at 37 rpm, one semi-finish pass with 0.010 at 45 rpm, and one finish pass with cut 0.003 deep at 54 rpm. Finish tolerance on the bore is plus 0.005 minus 0.000. Feed is 0.0104/rev. The machine used is a 50-hp Model 75 Bullard VTL.



ON A GISHOLT TURRET LATHE



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TAKE A LONG, HARD LOOK

at the "hidden strengths and values" found only in a Minster O.B.I. press. Quality is not always visible at first glance. The fine points of design and construction which mean the difference between good performance and superior performance can easily be overlooked.

When evaluating O.B.I. presses, carefully compare clutches, slide areas, recirculating lubrication systems, and inclining mechanisms. On any size—16 through 250 tons—a Minster O.B.I. offers you more value for your money. Ask a Minster representative to prove it.

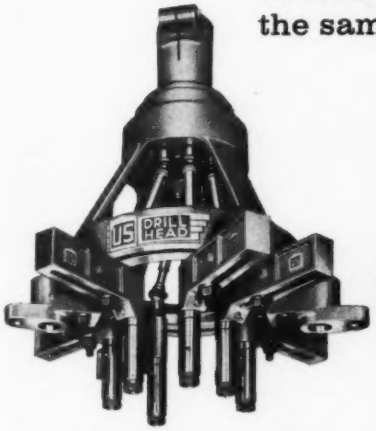
The Minster Machine Company, Minster, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 36

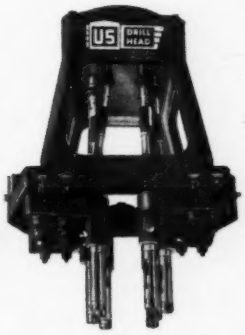
Quick-change deal...

or production runs... drilling only or drilling and tapping*... you can't beat the profit-making performance designed and built into universal adjustable **U.S. DRILL HEADS**

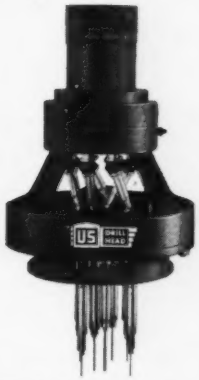
*When your drilling machine has a reversing spindle, you can drill and tap the same hole pattern with one head



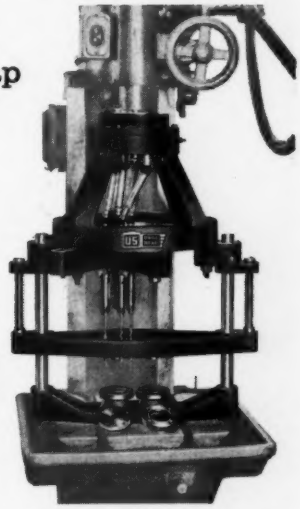
Style U Heads are built in 8 standard models — positive all-gear drive with shaved gears, antifriction bearings, and neoprene covered, lubricated quick-change joints—smooth, quiet, accurate.



Special head designs for single-purpose machines afford the flexibility of U. S. Drill Head's universal drives.



Slip Spindle Plates, used in place of the adjustable brackets, may be jig-bored to drill more than one pattern of holes.



Holding fixtures with guide bushing plates may be used for drilling two different workpieces at the same time, or to accommodate different hole patterns with a minimum of fixtures and setups. Guide bars maintain alignment.

US DRILL HEAD

Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO.

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Ask for Catalog AD-57, or send specifications of your requirements.

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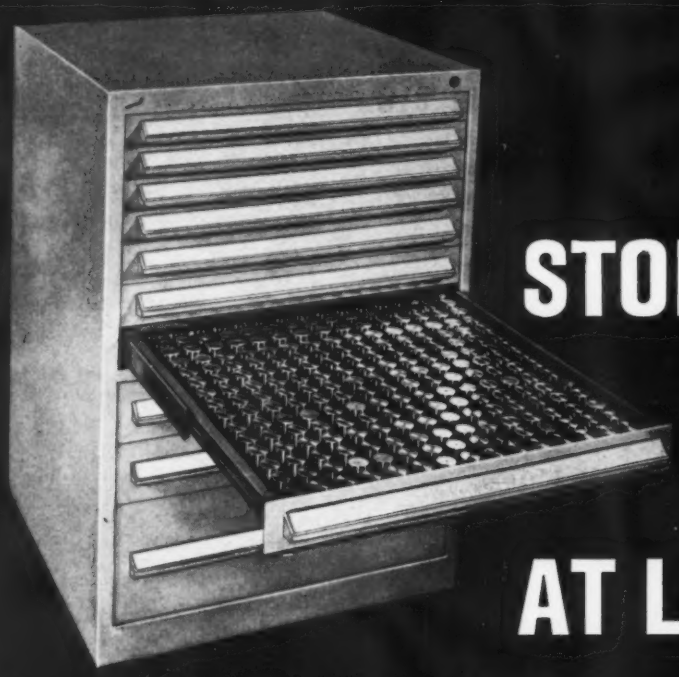

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A VIDMAR INSTALLATION LIKE THIS will store more, better, in less space than any other storage system available. Vidmar cabinets are designed and built expressly for industry . . . eliminate "waiting time", dirt, breakage and pilferage.

You can start your Vidmar facility with one or more cabinets. All units are modular in design—can be arranged, re-arranged, and added-to as required. Drawers are interchangeable within each cabinet or other Vidmar cabinets, and a specially designed and constructed suspension and extension system assures strength and stability. Drawers hold up to 400 lbs. each, without sagging, even when fully loaded.

Before you revise or add to your storage facilities, or plan the storage in new construction, it will pay you to look into the time- and money-saving advantages of Vidmar. Write today: Vidmar, Inc., 2326 Reach Rd., Williamsport, Pa.

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CIRCLE INFORM-A-GRAM KEY NO. 38

TOOLING & PRODUCTION
The Magazine of Metal Working Methods

Be Aware . . .

You are constantly looking for ways to "futurize" your manufacturing facility. Because you are, we publish this magazine and have the opportunity to serve you.

BUT, when you are serviced by our mention of new equipment or new ideas, do you immediately start the wheels that will put these developments into use in your facility? So it's not as easy as that, *but* you will be in shock sometime (perhaps too soon) when you find competition getting a lion's share — because they were more astute.

Design and manufacturing success are no longer just the product of good management and good men working with well maintained equipment. All that is still necessary, but the other essential ingredient is the use of the very latest equipment.

You could say this has been vital in any era. True, but you have to look more often — almost daily now — for what you might be using to push more and better parts out at more attractive prices.

Government too, has a bigger job than it perhaps realizes in its depreciation program. They had better approach it with serious consideration. The fact is that machines are often obsolete before they are in production.

During the development of a machine, ideas for its successor are being formulated.

To do justice to the consumer, we should have this benefit of products at the lowest price possible using the latest equipment.

R & D effort in every quarter pops up with new methods and equipment at a startling rate. Often, it's hard to justify the use of a machine of previous design regardless of how new it is.

This all means a tax structure to fit this ever changing complex. I respectfully suggest that the lawmakers be aware of the increasing rapidity of machine-concept-change. If laws are made now, without due consideration for this, industry will have short-lived respite and be in the same snit all over again.

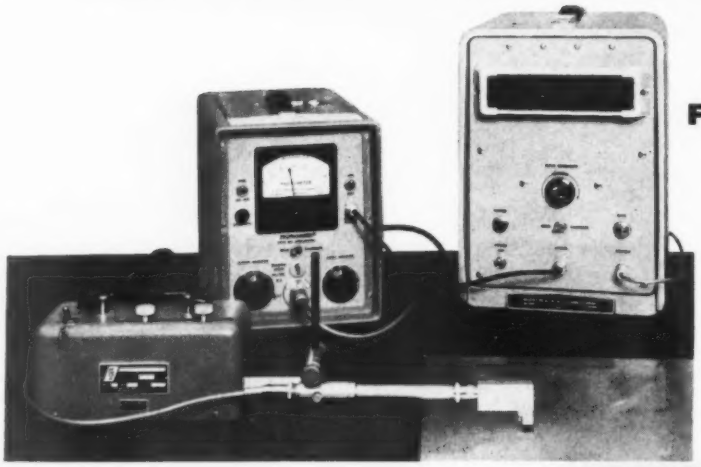
The question arises, "What possible evils could there be in having a permanent tax review board for appraisal of individual plant machine tool replacement programs?" If this could be kept "clean," it would encourage optimum upgrading of equipment in any plant, whenever it seemed feasible, for better manufacturing.

Try to avoid the panic you will be in if you wait too long to modernize. You must find a way to afford current machinery concepts as they become available. If you once get on top of the situation, it should be self-perpetuating—better facilities, more profit, etc.

If you think I'm tossing gloom, try this test: Make a list of the metalworking processes your products require. List the machines you now use opposite each process. Then contact each manufacturer for a performance comparison of your machines against the newest comparable machine concepts available. You may be in for a surprise.

William S. Hoffman
Editor

BREAKING MEASUREMENT BARRIERS WITH MICROMETRICAL



COUNTS ROUGHNESS PEAKS FOR CLOSER SURFACE CONTROL

The Profilometer® with Peak Counter adds a new dimension to control of surface finish. This new combination shows the number of roughness peaks above a preselected height, in addition to showing average roughness height in microinches. We developed it to help solve surface-finish problems for sheet steel makers and users; and it has many other potential uses—perhaps in YOUR plant. Ask for BULLETIN LT143 and see.

MEASURES SURFACE WAVES TO AID PRODUCT PERFORMANCE

With many products, performance depends on the waviness around surfaces of rotation. The Wavometer® measures such waviness, in microinches, on a production basis. Example: In meeting a Navy quiet bearing contract, a ball bearing manufacturer checks the waviness around every raceway, as shown at right.

For waviness facts and Wavometer features, ask for BULLETIN LT10.

SHOWS FULL DETAILS OF ALL SURFACE IRREGULARITIES

In research or inspection, would it help you to know the height and length of surface waves, bows, or roughness irregularities? Dimensions and location of flaws or wear? Straightness, roundness or concentricity of ID's and OD's? Alert manufacturers in many industries meet ALL such needs with the Proficorder®—get pen-drawn magnified profiles that show exactly what they need to know. Interested? BULLETIN LT24 tells all about it.

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CIRCLE INFORM-A-GRAM KEY NO. 40

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. 27, No. 8
NOVEMBER 1961

'Bent' Dies Extrude Big Missile Sections

by K. F. Braeuninger

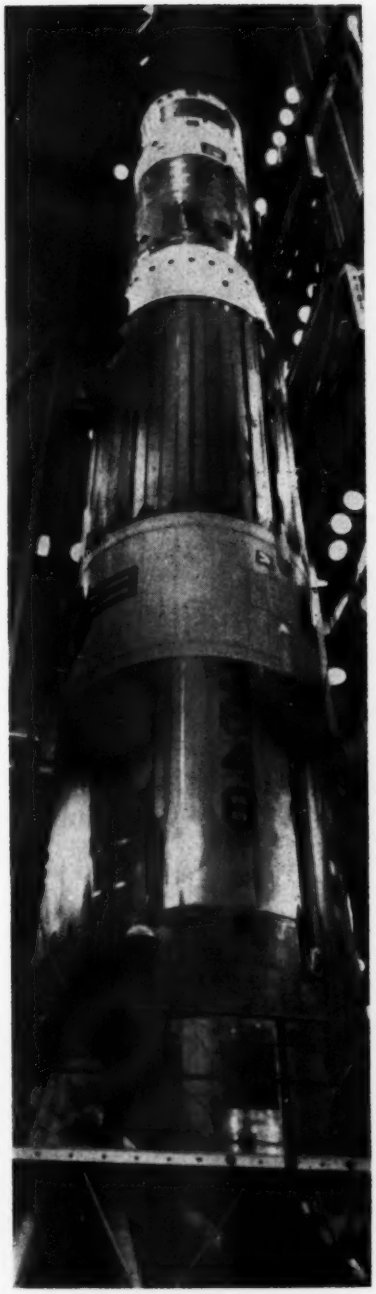
Mr. Braeuninger is manager, extrusion department, The Dow Metal Products Company at Madison, Ill.

THE EXTRUSION CAPACITY of the United States has been tremendously boosted in the past 10 yrs by the installation of heavy presses. Despite the size of this equipment, width requirements of sections often exceed normal production limits. But the section can sometimes be extruded in the shape of a "U" or a "V" and then flattened so that the designer still obtains the desired width, plus the many advantages of the extrusion process.

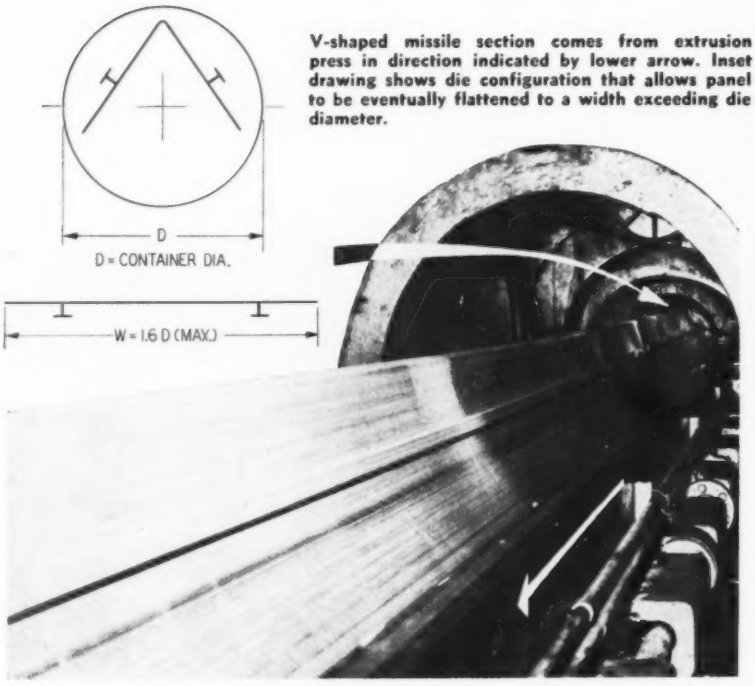
This procedure is followed by The Dow Metal Products Co., division of The Dow Chemical Co., in producing aluminum alloy 2014 skin panels for the Titan ICBM, designed and built for the Air Force by the Denver division of The Martin Co. Dow is one of three companies producing these panels.

Press Capability

Dow's heavy press, one of the four largest in the world for light



Completed Titan ICBM, showing extruded and chem-milled vertical panels above and below section bearing Air Force insignia.



V-shaped missile section comes from extrusion press in direction indicated by lower arrow. Inset drawing shows die configuration that allows panel to be eventually flattened to a width exceeding die diameter.

metals, has an available pressure of 13,200 tons (26,400,000 lbs). Pressures of this magnitude permit the use of very large billets, which in turn make possible the extrusion of sections with large circumscribing circle sizes in long lengths.

The extrusion ratio is the amount of reduction the metal undergoes when forced through the die, or the ratio of the billet area to the cross-sectional area of the extrusion. The higher the ratio, the greater the pressure required—70,000 psi for the Titan panels.

The normal maximum width of flat sections extrudable at this pressure on any of the heaviest presses is about 22″. Design of Titan skin panels calls for two 34″ sections, one with two integral stiffeners, the other with three. Extruding the section in a "U" or "V" shape is one of several methods available for extending the width.

Tooling Details

Tooling required to produce Titan sections consists of die, die backer, die bolster, die holder and billet container.

Die configuration is governed by stiffener location. Since a section cannot be extruded with a rib at the apex, the "U" shape is required for the three-stiffener panel. With the two-stiffener section, the simpler "V" shape is used. The radius at the apex of the "V" or corners of the "U" is a critical factor in subsequent flattening, having a decisive effect on the final flatness of the bend area.

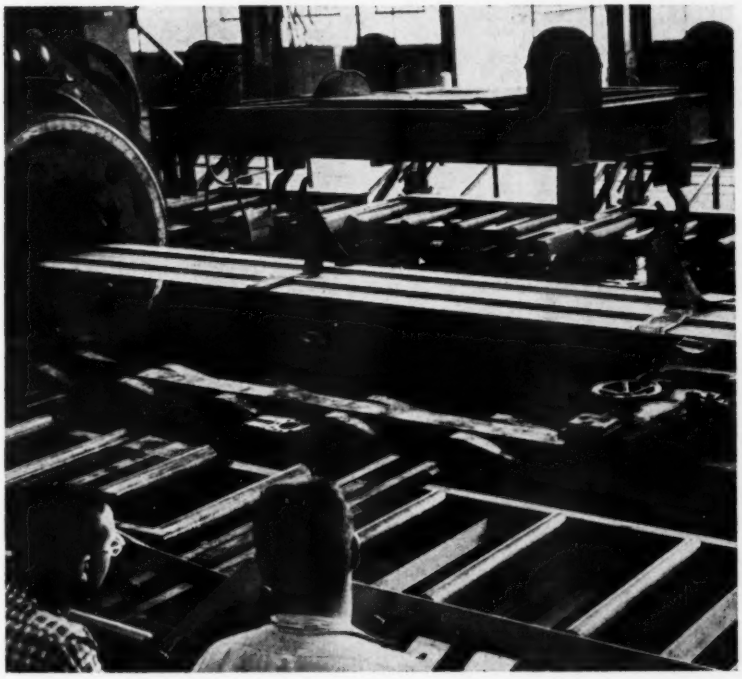
Die material is 5″ chrome hot-worked steel. Holes are drilled in the solid steel block at various locations. Then the block is transferred to a band saw, the blade is inserted in the holes, and the configuration is cut. Subsequent machining of this rough cut on milling and filing machines produces the final configuration of the die orifice.

The backer and bolster support the die against the tremendous pressures exerted by the press ram. Fabricated from the same material as the die, they are cut to the same general configuration but with a slightly larger orifice.

The dies are installed in a 40-ton die holder, and oven-heated to working temperature. Friction resulting from metal flow keeps die temperature at the correct level during extrusion.

The billet container, which surrounds the billet during extrusion, must possess sufficient strength to resist the tremendous lateral pres-

Panel enters flattening machine in direction indicated by arrow.



Stretching machine straightens panel, which had been warped after heat-treating and quenching.

sures exerted by the metal as it is pushed by the ram. The container consists of three coaxial cylinders, each fabricated from a different type of hot-worked steel (5% chrome is used for the inner layer), and shrunk together.

Outside diameter of containers used on the 13,200-ton press is 84″. Inside diameter varies with the job. Available sizes are 16, 18, 22, 25¼ and 32″. The pressure required to push metal through the die determines the size used. Dividing 26,400,000 lbs (the total press capacity) by 70,000 psi gives 380 sq in. Thus, the nearest container size is 22″.

This 55-ton container has 19 holes in the outer cylinder for electrical resistance heating elements. The container is installed in the press after being heated to about 580°F. Heating elements then bring it to the 700-800° F final working temperature. The container is divided into heater quadrants at each end for accurate control.

Billets match the 22″ ID of the container. Weight of the billet used for the "V" section is 1000 lbs; for the "U" section, which has an additional stiffener, 1200 lbs. Billet lengths are 27¼ and 33″ respectively. Billets are scalped, inspected for porosity and internal defects, and chemically analyzed before being brought to working temperature in induction heaters.

Only a small amount of lubricant is used during extrusion. This is applied at the start of the push to facilitate metal flow through the die opening.

Extrusion Process

To assure straightness, the missile section is kept under tension by a puller during extrusion. Straightness is critical, since it directly affects the subsequent flattening step, which is such a delicate operation that good results can be guaranteed only if the section meets certain conditions while still in the unflattened state.

After the billet has been extruded for all but a few inches of length, the butt end is separated by a 650-ton shear. The 40-50 ft long section is then pulled clear of the press, and transferred from the runout table to a walking beam cooling bed. After cooling, the section is moved by conveyor to a 60″ dia saw for removal of a short end piece, which usually is warped.

Flattening and Straightening

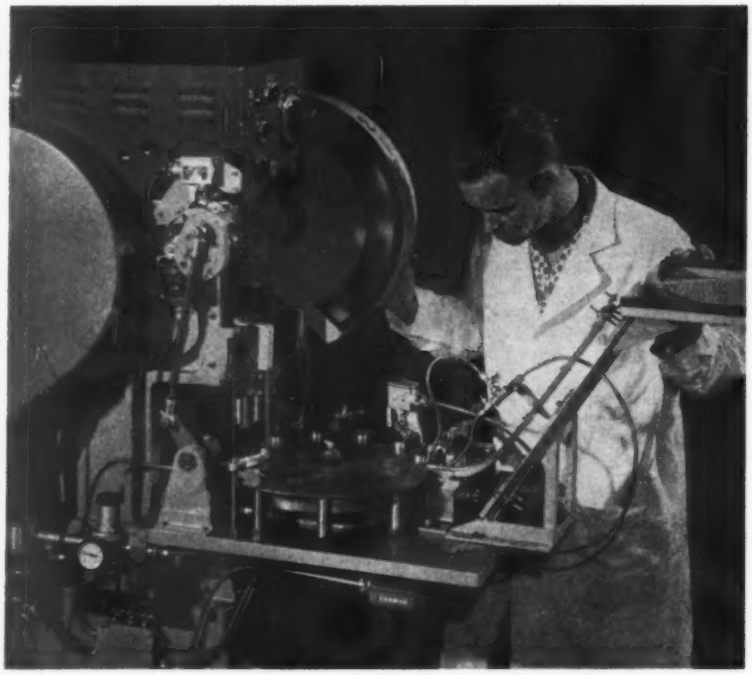
The flattening machine consists of a series of steel and magnesium pressure rollers that gradually but continuously correct the contour of the extruded sections from "U" or "V" to flat. Sections are completely flattened as they emerge from the machine.

Solution heat treating, to bring the material to its maximum physical strength, is the next operation. Emerging from the oven at 100 fpm and 935° F, the sections are subjected to torrential quenching, which very rapidly restores the metal to room temperature.

Since heat-treating and quenching cause considerable warpage, the sections must be straightened. This is done with a stretcher capable of exerting 1000 tons of pull. Tooling consists of jaws specially designed to grip the Titan sections. Stretching, which also removes the residual stresses induced by heat-treating and quenching, is automatic. The operator merely sets the controls for the desired percentage of stretch.

The sections are then cut to final length—20 ft for the two-stiffener panel, 12 ft 5/16″ for the three-stiffener panel—and put through a conventional roll-forming machine to achieve final flatness tolerances. The flatness tolerance in the bend areas on the stiffener side is 0.030 convex; on the other side, 0.030 convex or concave. Straightness tolerances for the stiffeners are also very close.

Sections are then shipped to Martin Co. for assembly into the lethal Titan. ■



Standard Press And Special Tooling . . . for automatic assembly

THE UTILIZATION of a standard machine unit to mount special tooling is often the most economical way to set up fully automatic production. Rosan, Inc., of Newport Beach, California uses a standard 8-ton Kenco Electro-Safe press with a dial feed table as the basic machine element to tool up a fully automated assembly operation. Several major design problems were solved to increase production from 200 parts/hr by hand assembling methods to 2500 parts/hr with the present automatic operation.

The problem was to assemble the two parts of a Floating Press Nut, Figure 1, in prescribed orientation to each other as well as to assure exact alignment of the resulting assembly when subjecting it to the "closing in" operation under the press punch. This setup also was needed to accommodate 10 different sizes of nuts. These conditions suggested the need for automatic check points that would detect faults at critical stations.

The Kenco Electro-Safe press was selected because its built-in controls are especially designed for ready interlocking with fault detectors and the press is constructed to stop instantly upon a stop signal command. This permitted effective use of fault detectors for malfunctions that would affect product

Fig. 1 The two parts and the completed assembly (upper) of a Floating Press Nut. The lower view is of the retainer, whose tab "windows" are pierced before assembly. The captive nut (right) is locked in the retainer by a closing die at station 7.

quality or cause damage to the equipment.

At the time the photographs were taken, the hopper feeding devices used to load the two components were under development and are not mounted in the setup shown. Temporarily, the two parts are hand assembled and inserted into the feed track.

The two parts of the press nut assembly are called the retainer and the captive nut. The retainer, whose tab windows have been previously pierced, is hopper fed with a vibrator into a gravity type feed track, Figure 2. Spring steel strips in the feed track orient the part by means of engaging the tab windows, preventing rotation of the retainer as it feeds forward in the track.

When the retainer leaves the track and enters a nest at Station 1 on the dial feed table, a keeper of spring steel in the nest engages the tab windows and retains part orientation throughout the cycle. Station 1 is monitored by an air cylinder-actuated feed finger which is synchronized with the press cycle. The feed finger provides timed escapement of each part as a nest reaches feed position. Should a part not enter the nest, the feed finger will not reach its limit of travel and the resulting fault signal to the Electro-Safe press controls will stop the press.

After an idle station, the retainer is indexed to the captive nut loading station which also uses hopper feed. Loading of the captive nut into the retainer is done with an interesting device which positions the torque tabs, or ears, on the nut in proper relation to the retainer tab windows. The joined parts index through a counting station to the "close in" station under the press ram where a closing die deforms the retainer rim to lock the assembly together.

The sequence of operations on the Electro-Safe press dial feed table is:

Sta. 1 — Feed Retainer (Hopper Feed)

Sta. 2 — Idle

Sta. 3 — Feed Captive Nut (Hopper Feed)

Sta. 4 — Idle

Sta. 5 — Counter

Sta. 6 — Idle

Sta. 7 — Deform to Assembly

Sta. 8 — Eject assembly

Sta. 9 — Idle

Sta. 10 — Idle

Sta. 11 — Safety check for malfunction

Sta. 12 — Idle

The unloading station ejects the completed floating press nut from the nest by a blast of air. After unloading, each nest is checked for ejection malfunction by means of a limit switch which will give a fault signal and stop the press if a loaded nest passes this station. ■

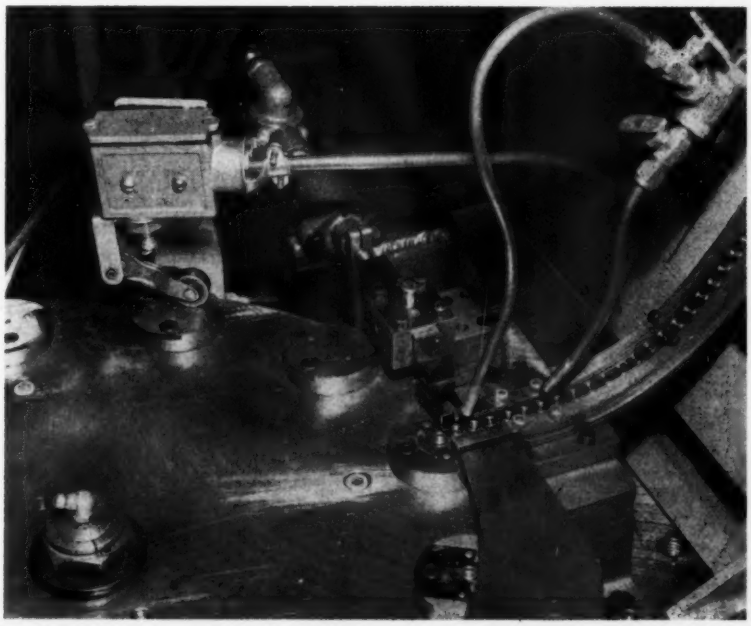
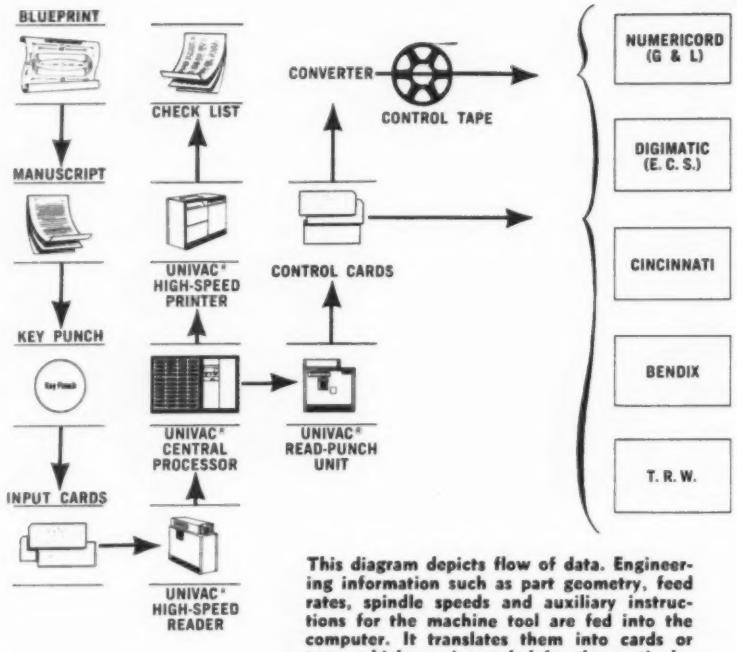


Fig. 2 From the feed track, a retainer enters a nest at station 1 on the dial feed table. Should the part not enter the nest a "fault" signal will stop the press.

New Computer Service

Aids Numerical Control



This diagram depicts flow of data. Engineering information such as part geometry, feed rates, spindle speeds and auxiliary instructions for the machine tool are fed into the computer. It translates them into cards or tape, whichever is needed for the particular numerical control device of the many the program can service. Only a few are named here.

APT IS A TERM that is apt to take numerical control to the doorstep of small and medium-size shops all across the country. These shops have often found prohibitive the cost of manually writing instructions for numerically controlled machine tools.

The new APT (automatically programmed tool) system makes part programming on a computer economically justifiable.

A computer interprets design information and calculates appropriate directions for tool control. The computer allows automated and accurate small lot production of highly complex parts. It achieves large savings in lead time and final cost of machine tool products. It accelerates the transfer of engineering design to produced parts. It reduces human error and saves time and materials. The end result should be a more reliable product.

The Basic Idea

The idea and prototype of the APT system were developed by the Massachusetts Institute of Technology Servomechanism Laboratory, sponsored by the U.S. Air Force. (TOOLING & PRODUCTION, August 1961, pp. 8 and 35.) Nineteen aerospace plants, under MIT direction, developed an industrial version of the system. Findings in the original research were tagged APT II. The current program is called APT III.

Remington Rand Univac and Rohr Aircraft Corp., Chula Vista, Calif. developed the new programming system jointly for the Univac 80 and 90 solid state computers. It greatly simplifies compiling of the complex instructions needed to guide numerically controlled tools in the machining of parts. It's able to guide machine tool devices of many different manufacturers.

How It Works

The new Univac program uses a part programmer's manuscript, a simple statement of manufacturing information from an engineering drawing. Cards are punched from this manuscript and fed into the computer, where they are interpreted. Punched cards used to control a machine tool are then produced automatically by the computer. Or cards are converted to punched, or magnetic tape as needed.

Tool instructions by the computer allow production of parts on

A Morey A-50 profiler at Rohr Aircraft Corp., automatically mills out an engine mounting box beam from a steel forging under computer-generated numerical instructions. Nils Olesten, numerical control general supervisor for Rohr, and Dr. Gastone Chingari (right), director of numerical control Remington Rand, study drawings.

Seven-In-One Answer to Hydraulic Needs

Seven is more than a lucky number to the new W07 variable displacement hydraulic pump.

The new seven-in-one pump was conceived by Weatherhead Co. engineers to answer the demands of advancing hydraulics technology for highly reliable, automated equipment with more horsepower per pound. There are seven cylinders in the unit, each with a piston, connecting rod, and low-mass check valve constituting a separate pump independent of the others, but phased into a common outlet port.

The axial piston pump, delivers exceptional control versatility higher maximum speed and pressure capability. Pressure control ranges from 250 to 3000 psi and can be provided as a standard, and integral part of the pump. Nominal output is 9 gpm at 3600 rpm (continuous) at 3000 psi.

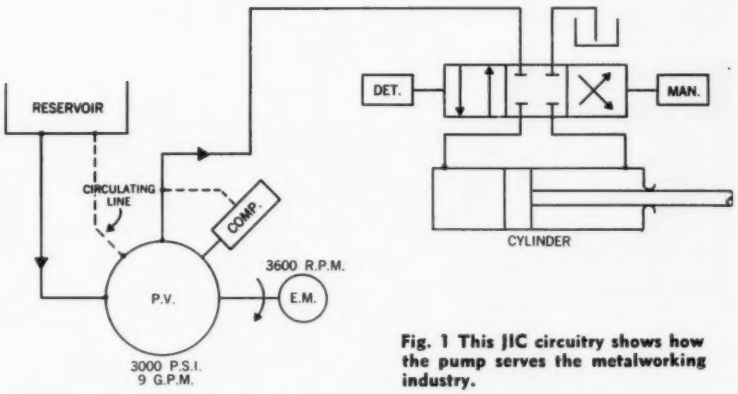


Fig. 1 This JIC circuitry shows how the pump serves the metalworking industry.

Fields of application include machine tool, metal fabricating, automotive, materials handling, and mobile construction, to name a few.

The unit's drive shaft and cam are its only two rotating components. Mechanical efficiency is also furthered by the pump's individual discharge check valves. They make it immune to cavitation effects common to pumps with port plate valving. Units are furnished flange- or base mounted, as motor-pumps, or complete hydraulic power units.

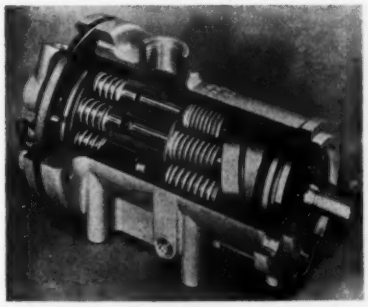


Fig. 3 Cutaway view of the W07 Weatherhead hydraulic pump.

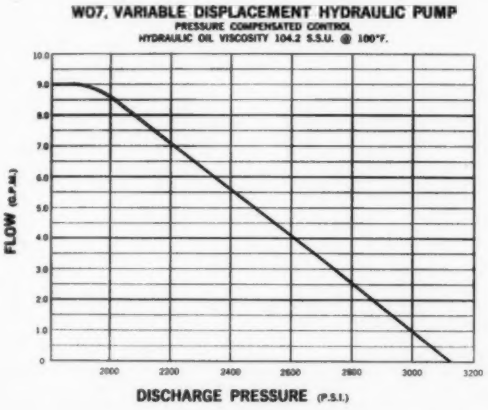


Fig. 2 Pressure control ranges from 250 to 3000 psi and can be provided as a standard and integral part of the pump.

For more information about these lightweight (14 lb) compact (5¾" maximum diameter) pumps write the Weatherhead Co., 300 E. 131st St., Cleveland 8, Ohio, or circle Inform-A-Gram No. E2.

. . . Numerical Control, from preceding page

"continuous path" machines. The high speeds of the computer permit rapid definition of thousands of instructions, which enables a machine tool to mill even complex contours.

Machines at Rohr Aircraft that are guided automatically by computer-generated instructions are a Giddings & Lewis profiler, Morey vertical profilers, Cincinnati skin mills and a Cincinnati traveling column. These machines shape a variety of aircraft parts.

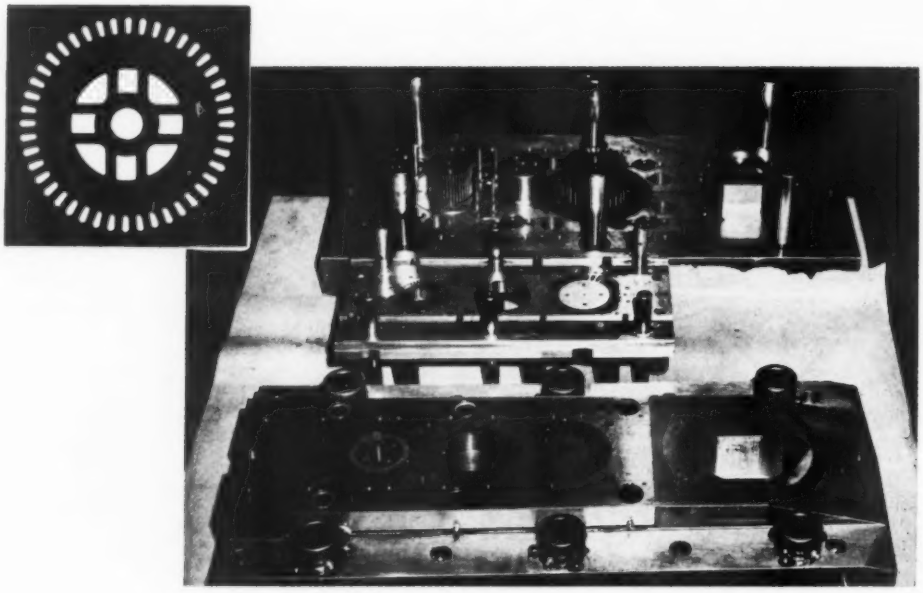
The Future

Numerical control of machine tools is still in its infancy. There are predictions that 90% of machine tool production may be automatically controlled by 1970.

Univac plans to make its numerical control programming routines available without cost to industrial users who employ the company's solid state computers. Manufacturers who do not own computers can have their instructions programmed at Univac Service Centers here and abroad.

APT III now embraces the Univac 80 and 90 solid state computers and the IBM 709/7090 computers (TOOLING & PRODUCTION, August 1961 Autopromt.) It is planned to include Univac Thin-Film Memory Computer. This computer has memory access speeds that are measured in billionths of a second —nanoseconds—as against millionths in the fastest current computers. ■

From the Cover:



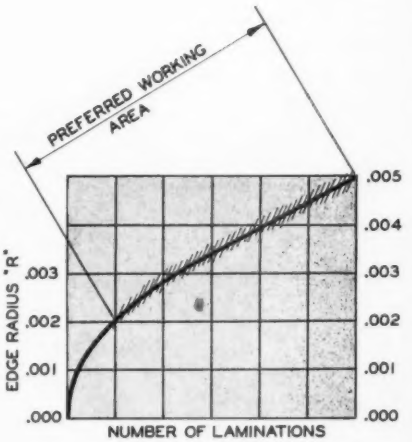
Who Ever Heard of Dull Grinding?

THIS IS WHAT they call it at Emerson Electric Mfg. Co., St. Louis, Mo. And they use the recently developed Bausch & Lomb Die Wear Microscope to establish how "dull" to grind.

The microscope shows the exact condition of the cutting edge, which, when projected on the graduated reticle, helps them figure how dull they can leave the die and still get good parts. Their thinking is tempered by past performance records kept on each die.

Eugene Paul, an Emerson project engineer, says the technique of "dull die grinding" has been practiced for some time, but before the advent of the Die Wear Microscope, they could only estimate how much to grind a die when sharpening it.

Much of their stamping is based on the premise that a die doesn't have to be "new sharp" to turn out good parts. If a die is ground down past any radius condition (bellmouth) that developed in production, the life of the die is being shortened. Thus if a few extra



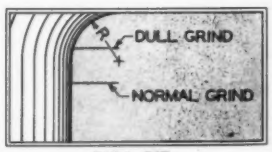
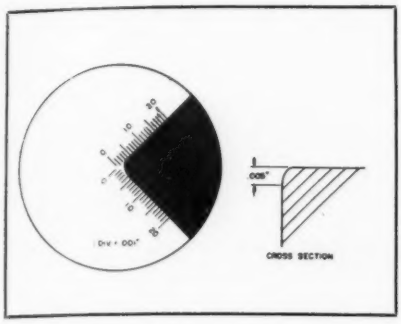


Fig. 1 Chart shows dull grind technique as practiced at Emerson. By use of Die Wear Microscope they can establish how little to grind off when sharpening the die and still get good parts. From past records kept on each die, they know how much to grind off to always be stamping parts when die wear is somewhere in the preferred working area. Sectioned die shows that a normal grind would remove 0.002 of die life more than is necessary.



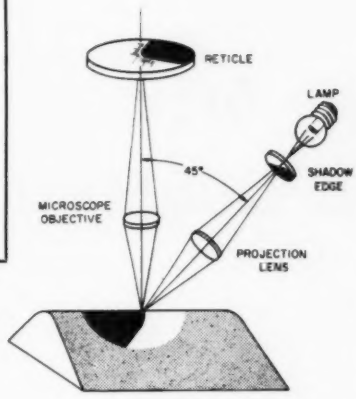


Fig. 2 Diagram showing how Die Wear Microscope does its job. Complete description detailed in text.

thousandths are removed at each sharpening, the number of possible sharpenings is reduced.

Emerson uses many long run dies in lamination work and other product stampings. These dies operate at more than 200 strokes/min. Detailed performance records are kept for both steel and carbide dies. These aid resharpening decisions made through use of the Die Wear Microscope. Data is not kept for dies that have chipped edges. Chipped edges may require other than dull grinding techniques for maintenance. The dull grind is used only for correcting normal attrition.

Recent data from Emerson's perpetual records show that 40 dies sharpened by dull grinding have increased the number of stampings per thousandth of die plate by 84%. For example, where they were formerly averaging 1000 parts per thousandth of die plate they're now getting 1840. This represents 54% more parts per die cost.

In addition to reduced die replacement costs, other benefits are reductions in maintenance labor and grinding wheel cost. Less maintenance is obvious, and service with less downtime results. Rework is done now only when the true condition of the cutting edge is known.

The microscope is supplied either as a battery operated unit or with an accessory transformer for 115V use. It is compact and lightweight for easy portability. Its base is removable for hand holding. In either attitude, a V-shaped guide positions the 'scope in relation to the edge to be viewed. The guide can enter a 3/32" dia hole, or a special guide can be provided to facilitate fillet measurement.

Here's how it works: A straight line shadow is projected by a beam of light onto the edge of the die to be inspected. This hits the edge at a 45° angle, and is bisected by the edge. The image of this shadow is picked up by the microscope objective lens to form an enlarged image through the calibrated reticle. The image is not distorted; it is as it would be if the die could have been sectioned and viewed at right angles (90°) to the section.

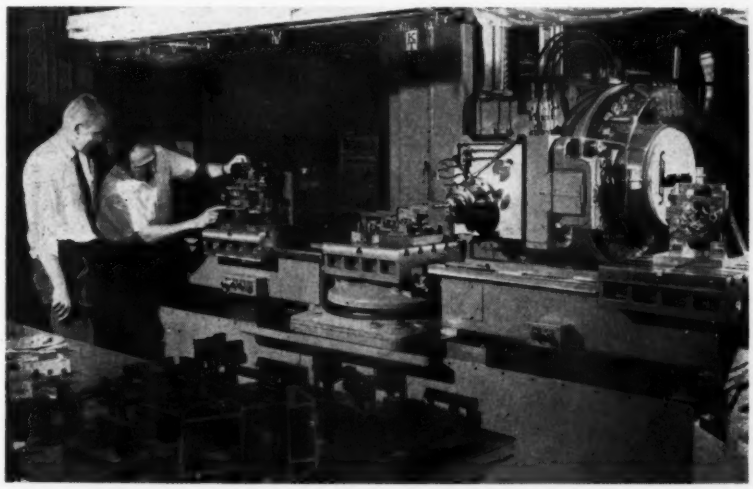
Reticle graduations are 0.001. Magnification is 65X, and although the instrument was developed for measurement of die wear, it can also be used to measure bevels, burrs and fillets. Ingenuity will undoubtedly suggest other uses.

Inform-A-Gram No. E3 will bring detailed information on the Die Wear Microscope.

New Service Concept

A new concept in machine shop service provides numerically-controlled, economic work to companies introducing new products that require small quantities of precision parts with minimum lead time. It also helps firms that need only 10 to 25 vital machined parts per month, or 200 to 300 total per year. This allows reduction of costly inventories. Another timely service offered is control tape preparation for industry.

The manufacturing center of this shop is a numerically controlled Kearney & Trecker Milwaukee-Matic.



The new company, Numeric Machining Inc., 2309 Snelling Ave., Minneapolis 4, Minn., Elmer Hankes owns the company, and also planned the service. President is Dan Stenoien.

For information write Numeric, or circle Inform-A-Gram No. E4.

Vendor Certification

An Early Step Toward Quality Attainment

by Lawrence J. Curran
Associate Editor

"YOU'LL DOUBLE TOOL LIFE with this new cutter we've got." Sound like a typical "pitch?" It's a sales approach heard by purchasing executives many times each week, and it's not always promotional "froth." But sometimes it is, and that's one reason the engineering department of a Midwest spark plug producer embarked some 3 yrs ago on a program to reduce the frequency of unfounded sales claims.

The facility makes spark plugs for a variety of engines—including marine, military, aircraft and automobile. Since installing an "engineering evaluation" program, personnel there have tested more than 1000 separate items used in the plant, or directly in the manufacture of spark plugs.

Making the List

If a vendor's product performs successfully during this testing, and there are enough advantages to be gained through its purchase, that vendor is placed on the approved list. If there is no significant improvement foreseeable after the EE test, the person responsible for conducting the test so notes on his EE report, and the vendor will be kept off the approved list.

In this way, the firm keeps a constant surveillance on its suppliers in a program that's independent of a separate quality control department, but which supplements quality control significantly.

The wrong "foot in the door" could have an adverse effect on production. By now, word has probably spread in sales circles that you'd better be pretty sure of the claims you make when you get your foot in the door at this plant.

How Program Evolved

The chief production engineer describes the program as "a common sense evolution from a problem." The problem arose when there was no formal system to account for a sample item offered by a salesman—whether it be oil-absorbing floor compound or a carbide insert for a heading die.

If the salesman could get as far as the production line, he sometimes left a sample to be tested with someone he knew there. The next time the salesman called, he would ask his acquaintance how the item performed, and the acquaintance sometimes couldn't even remember the salesman, much less tell him how his product tested.

So the chief production engineer worked out the engineering evaluation program. The product to be tested might be a cutoff blade to slice ceramic rounds as they come from an extrusion press. This highly-abrasive ceramic is about the consistency of modeling clay at this stage. Engineering records show how well the present tool is doing, and the test for the sample tool is based on these. There's no room for a disgruntled vendor to claim that results are unrealistic, since testing is done in a production application.

When test notations or the test engineer's observations are completed, the supervising engineer either recommends approval or rejection of the vendor whose product has been tested.

This procedure is the only authority by which Purchasing may delete vendors from, or add them to, existing approved lists.

Purchasing and engineering personnel try to assure that any item to be evaluated is secured by purchase order. This is the first step in building a complete "file" on a vendor's product, and avoids any undue obligation in testing the material. The person making the purchase requisition includes on it the purpose for purchasing the material, and the EE number.

Composition of EE Form

The EE form (see cut) lists the material to be tested, the vendor's name, the test outline, a summary of the results, and the test engineer's recommendations based on performance. It also carries the purchase order number of the material tested, and the name of the test engineer.

Three copies of the EE form are made for each tested item. The chief production engineer files one of them finalizing the results, the engineer keeps one for reference, and the third is issued to the plant superintendent's office to be

ENGINEERING EVALUATION

MATERIAL NAME:
Carbide Work Stop Tip XXX
Per change suggestion CS-6-25

No. 684
Date: 10-6-60
P.O. 6600

VENDOR:
Drill Supply Vendor #5

Test Engineer W. Kleist

OUT LINE OF TEST:

A 3/8" long carbide insert was placed on the end of this tip to see if increased production could be achieved. Average production on a standard steel tip is approximately 400, 000 pieces per rework.

These tips were used on the combination welders and threaders in Dept. 6.

SUMMARY OF RESULTS:

Tip #	Placed in Production	Approx. Pieces Produced	Removed
1	11-27-60	2, 560, 000	Still in machine
2	12-1-60	2, 500, 000	Still in machine
3	1-19-61	1, 800, 000	Still in machine
4	2-1-61	1, 600, 000	Still in machine

These tips still show no noticeable sign of wear.

RECOMMENDATIONS:

In conjunction with this test, two different design ceramic inserts were also tried on this application but both designs chipped with less than an hour's production.

It is recommended that our present work stop tips be changed to the carbide insert design.

DATE: June 9, 1961

W. Kleist
Test Engineer

DISPOSITION:
6-10-61
Accepted. Issue tool change number.

L. F. Dunn
L. F. Dunn
Chief Production Engineer

Samples of the Engineering Evaluation form, outlining a vendor item's "test history."

routed to the department foreman assigned to testing. He must keep the test data sheets, results, and if possible the product being tested. The finalized report is made out and distributed by the engineering department, based on the coordinated findings of the department foreman and test engineer.

This tight procedure is doing invaluable service for both the spark plug plant and its vendors. It contributes to spark plug quality because any item that has any influence on their production is so thoroughly evaluated. And it shows a rejected vendor just why his product didn't pass. Vendors often resubmit an item for testing after the EE has pinpointed the "failure factor."

If a product is accepted for a production application, a tool change notice is issued by the engineering department, with the EE number referenced on it, to alert both the production and purchasing departments. Usually the newly adopted material is phased into production gradually. Thus more amplified records on performance can be compiled, and factors not discovered in the EE won't result in sub-par quality in an entire department's spark plug output.

But just because a tested item outperforms one already in production doesn't mean the company will jump to replace the material already in use. The new tool might cost twice as much as the working one, so it must result in enough savings, due to added life, etc., to make up the cost differential in added production.

The engineering evaluation program is still in its infancy at this plant, but the chief production engineer is looking for more work for it every day. The more than 1000 items screened so far are just a start. There are some 4000 separate purchased items that effect production at this facility. Each will be put to the test eventually. ■

Fig. 1 Ambrose Swasey, a founder of Warner & Swasey Co., stands beside the circle dividing engine he designed and built in 1896. He called it the toughest development of his career. The engine was housed in a special vault below the plant.

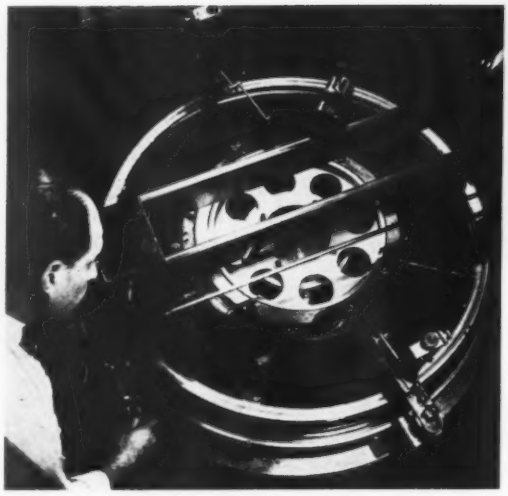
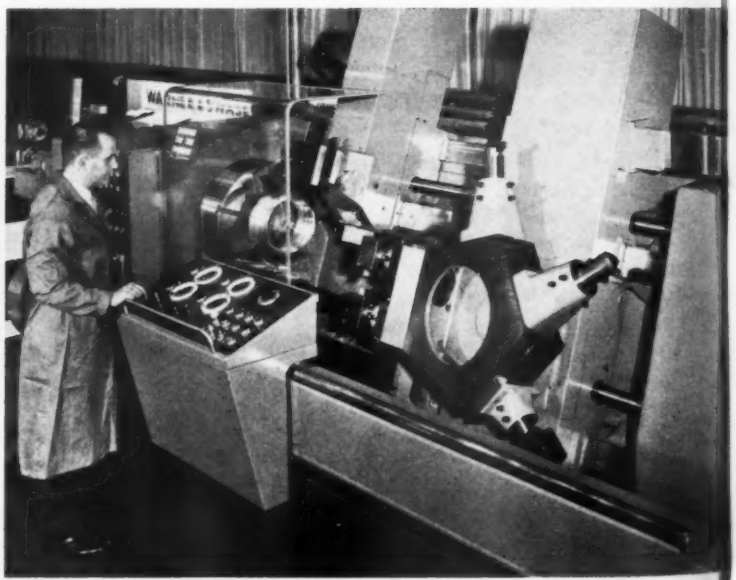


Fig. 2 The same dividing engine is still on the job, scribing an extremely accurate master encoder disc for the electronic system of the company's new numerically controlled Servo-Feed turret lathe. Accuracy of the dividing engine is within 1 sec of arc.

19th Century Dividing Engine Still on the Job

Fig. 3 Optical encoder disc, reproduced photographically from a 39" dia master disc produced with the aid of the old dividing engine, is inspected before being installed in the optical encoder of the numerically controlled lathe. The master encoder was clamped to the engine's circular table and divided into 2048 equal sections. During scribing, the table indexes automatically, marking off divisions on the master disc at the rate of 3 lines/min. The job took 11.4 hrs.

Fig. 4 The discs function as light gates in Servo-Feed lathes, either passing or blocking rays from a light source to a series of photoelectric cells. The pattern of light reaching the cells is translated electrically into feedback signals for the machine's electronic memory and tape control system.



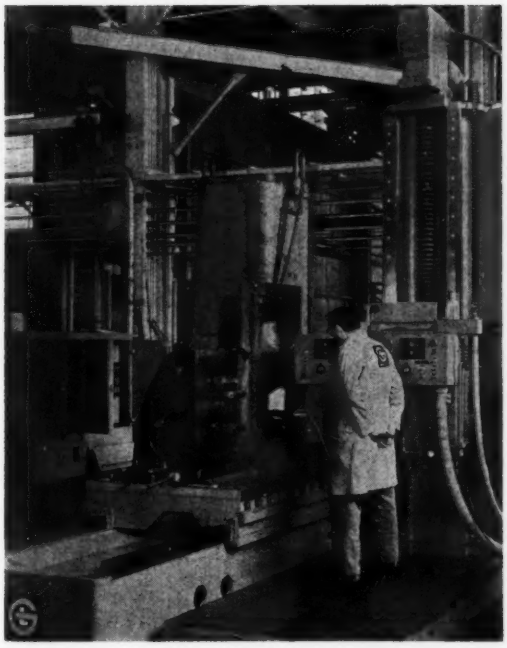


Fig. 1 The Giddings & Lewis DiMil contour milling machine is specifically designed for numerical control. Three of these units, each with three axes of continuous programmed motion, have been ordered by Douglas Aircraft Co.

Skybolt and Numerical Control

Use of the Douglas-developed FASCAN (five-axis small computer application) and the industry-developed APT (automatic programmed tool) numerical control computer program has these machine and control combination advantages: production scheduling is predetermined because the machines' operation is automatic; accuracies are better and more consistent, resulting in better-fitting assemblies and fewer parts; inspection time is reduced, and tooling costs are cut. The cost of preparing the taped program for one of these machines falls far short of the tooling cost with conventional machines. Production of other parts makes this cost difference even more significant.

A 1000-lb forging on a G & L Variax mill was reduced to a 90-lb missile component in 36 hrs. Machining both the front and back side of the part required only two changes of position on the mill.

The whole group of machines consists of 5-axis profilers, 3-axis DiMil profilers, and vertical turret lathes, all from Giddings & Lewis. Douglas purchased 4-axis Omnimils from Sundstrand with personal funds, in addition to the Air Force units.

All machines will be equipped with new Bendix Dynapath solid state control systems.

The Air Force and Douglas Aircraft Co. have joined to express confidence in numerical control's capabilities. Funds for numerically-controlled profiling machine tools, costing more than $3-million, come from the Air Force Industrial Modernization Program. The aim is updating the Air Force owned manufacturing facilities in the Skybolt Program.

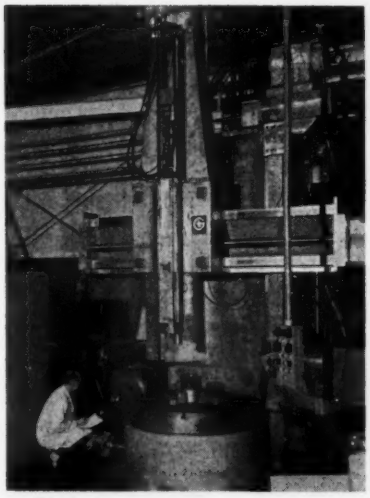


Fig. 2 Two vertical turret lathes of this type, with continuous path numerical controls, have been ordered for use in the Skybolt Program. They'll do turning and boring as well as intricate contouring without conventional templates.

Buy Now, Convert Later

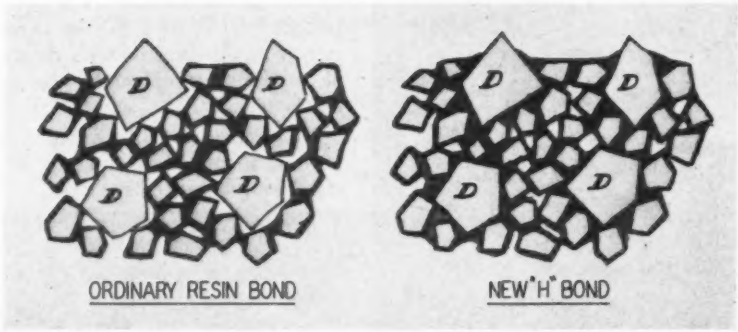
A new interchangeable design feature now allows one to buy a new lathe with manual shift and convert it later to hydraulic shift at little more than the original price.

The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, offers its new Regal lathes on this "convert later" basis.

A Servo-Shift package that fits inside the standard headstock makes such easy conversion possible. The package consists of: a shift-control unit under the headstock cap (hand levers are removed and replaced by a single dial;) a crawl speed gear train that mounts on a built-in bracket at the end of the headstock; a hydraulic motor-pump that mounts on the opposite side of the same bracket; and a small relay chassis that fits neatly among the standard electricals.

These new Regal engine lathes come in four sizes from 13 to 19" capacity. The units can also be purchased with the Servo-Shift as original equipment. The 17 and 19" models can be furnished as plain bed gap lathes, with a special carriage and removable block with 50% increase swing through the gap, according to the company.

Better Bond Means



Better Diamond Wheels

TRUE CHEMICAL ADHESION seems to be the secret behind a new method of bonding resinoid diamond wheels. In this method, the bonding agent adheres chemically to the diamond grit, instead of merely providing a mechanical socket for the abrasive.

Precision Diamond Tool Co., developer of the new "BH" resinoid bonded wheel, says it will give considerably longer service than conventional wheels because diamond particles won't be prematurely loosened from their sockets.

The Elgin, Ill., firm reports that the "BH" wheel is available in all popular toolroom sizes and shapes.

Results obtained in tests that compared Precision's own common resinoid bonded wheels with the "BH" wheel, which have reportedly been confirmed in field tests, use a wheel type, D11V9—3¾" x 1½"—MD150-N100 BH 1/16 both for wet and dry grinding. Where infeed and crossfeed were constants and tests were repeated five times the results were:

Dry grinding

Efficiency:

At 0.001 per pass new bond 228% to old 1000%.

At 0.002 per pass new bond 210% to old 1000%.

Wheel wear:

At 0.001 per pass new bond 0.0007, old bond 0.0016.

At 0.002 per pass new bond 0.0019, old bond 0.004.

Wet grinding

Efficiency:

At 0.001 per pass new bond 250% to old bond 100%.

At 0.002 per pass new bond 273% to old bond 100%.

Wheel wear:

At 0.001 per pass new bond 0.0004, old bond 0.001.

At 0.002 per pass new bond 0.0011, old bond 0.003.

Circle Inform-A-Gram No. E8 for more data.

New PMI Officers Elected

Mr. Primrose

Mr. Higgins

William J. Primrose Jr., vice president of Dickey-Grabler Co., Cleveland succeeds Marion A. Sherwood as president of the Pressed Metal Institute.

Primrose was elected at the Institute's recent annual meeting at Point Clear, Ala. C. W. Cederberg is the new first vice president, while Clement C. Caditz becomes second vice president. Cederberg is treasurer and general manager of Larson Tool & Stamping Co., Attleboro, Mass. Caditz is president of Northern Metal Products Co., Franklin Park, Ill.

Edward R. Voytovich, general manager of HPL Mfg. Co., Cleveland, was chosen secretary-treasurer.

Two awards were also made at the proceedings. The PMI Annual Achievement Award went to Carter C. Higgins, president of Worcester (Mass.) Pressed Steel Co., for his "outstanding service in promoting his industry and the Pressed Metal Institute."

Higgins is a past PMI president, and he made his firm's yearly Presteel Award, co-sponsored by PMI, and given in recognition of outstanding contributions to the field of metal stamping. This year's winner was the American Society of Tool and Manufacturing Engineers, cited for the beneficial effects on metal stamping of its Creative Manufacturing and Research Reports.

Splitting Seconds . . . with Optics

The Milichex Model MOX-3600 optical polygon.

A precision optical tool developed by a Michigan firm to check angularity and alignment of its own machines has proved so successful that the company has added it to the regular line of production and checking equipment in manufactures for industry.

Michigan Tool Co., Detroit, turned to optics to meet the tight tolerances in angular spacing demanded by an increasing number of rotating parts, e.g., machine tool indexing tables. This tool, called the Milichex Model MOX-3600, is, in effect, a 360-sided optical polygon that offers angular spacing accurate to split seconds of a degree. It checks angular spacing and alignment in any multiple of full degrees.

When used with an autocollimator or similar optical sighting device, the optical polygon provides an accurate mirror surface that reflects the projected image of the sighting device's cross hairs. The amount of deviation between the reflected image and the graduated cross hairs in the sighting device gives a geometric check on misalignment, parallelism, angularity, etc. It replaces any conventional multi-sided polygon divisible into 360 degrees, according to the Detroit firm.

In one typical use—checking accuracy of settings of a machine tool indexing table—the procedure is as follows:

The MOX-3600 is placed on the table approximately at the center. It is then oriented into coincidence with the autocollimator to establish the initial zero position of mirror to collimator. The unlocking knob is then turned and the polygon is rotated, say 10° and locked. The table to be checked is also rotated 10°, according to its own calibration, but in the opposite direction.

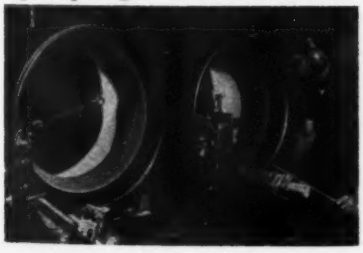
The error in angularity with respect to the initial zero position is viewed with the autocollimator.

The heart of the instrument consists of two matching sets of 360 ground and lapped teeth. In operation, the unlocking knob raises the upper set of teeth and permits the table top (with optical mirror) to be rotated to any full degree angular setting as indicated on the scale. A magnifying glass is mounted in place for easy viewing.

When the knob is returned to the "locked" position, upper and lower sets of teeth mesh and automatically lock into very precise angular position. A magnet is integral with the base for holding the instrument in place. Accuracy of the Milichex is within ¼ second of an arc or 12-millionths at a 20" dia. Circle Inform-A-Gram No. E5 for more data.

The optical polygon checks the accuracy of the worktable on a hobber.

Spraying with Ceramics



With the advent of the space age a number of new processes arrived on the scene. One is the use of ceramics for flame spraying missile components.

Here two ¼" ceramic rod spraying machines, manufactured by Metco, Inc., Westbury, L.I., N.Y., are at work on missile components. Both units are equipped with extensions as the inside diameter is being coated. The surface is cleaned and roughened by blasting with sharp non-metallic abrasive. Spraying consists of an 0.004 nichrome undercoat followed by 0.045 of zirconia, an effective heat barrier. Inform-A-Gram No. E6.

Tooling, Transfer Dies Tame a Problem in Miniaturization

This article traces a concept from inception, through demonstration of its feasibility in a simple design, to production status in more sophisticated designs.

AS DESIGNS OF ELECTRONIC devices become smaller, methods to make components for these devices become increasingly difficult. Conventional ways to produce small parts have become ineffective due to the size and precision new designs demand.

In fabricating small drawn metal components, for instance, manual handling of incomplete parts between the raw material and completed stage is slow, and often unsuitable for accurate positioning in a tool.

Engineers at the Allentown Works have developed a new method to make drawn components smaller than 7/32" in diameter, utilizing commercial transfer presses. The components are used in manufacturing transistor encapsulations.

An important feature of the new method is the use of interchangeable die sets. In manufacturing eyelets, for instance, the transfer principle is used, but each operation (blank, draw, form, etc.) is accomplished by a separate die set.

Only One Die Set

The most economical approach would have been to apply the transfer principle embodied in the eyelet machine operation. But instead of mounting separate punch and die details in the press, the individual stations were mounted in one die set. The part is passed from station to station by means of a transfer slide, rather than as part of a scrap skeleton as in a normal progressive punch and die.

The transfer press used in this application utilizes two rams, which are actuated by cranks 180° apart on the crankshaft. While the plunger is elevated, coil stock is roll fed from front to rear under the blanking plunger on the left. As stock comes to rest, the blanking punch descends and cuts a blank that is forced through the die into a nest in the transfer slide.

When the blanking punch ascends, the cam-actuated transfer slide is moved to the right, carrying the blank to the next station. The slide holds the blank until that punch descends and pushes it through the slide into the die cavity, where it is formed. The cycle is completed as the punch ascends and the transfer nest moves back under the blanking punch.

Positioning Critical

Accurate positioning of the blank under the punch is required. This is assured through two features. First, the blank is **deposited** in the transfer slide nest. Secondly, slide location, accurate to ± 0.001, is provided through sturdy pilots that engage a common slide bushing.

Secure locking of part to punch is accomplished by embossing the code stamp of the part against a die cushion that's valved to exhaust at the bottom of the press stroke. The die cushion returns to its normal position during the down stroke of the blanking ram.

The return motion does not have to be accurately synchronized because the drawn part is mechanically lifted to transfer height by an ejection plunger and bar assembly actuated by spring-loaded lifter pins mounted in the right hand die shoe. This permits me-

(Based on an article by Frank A. Haggerty, Ernest A. Kromer and David V. Oltman, which originally appeared in the Western Electric Engineer. *Mr. Haggerty is planning engineer, Mr. Kromer is design engineer, and Mr. Oltman is tool and gage inspector at the Allentown, Pa., Works, Western Electric Co., Inc.)*

chanical ejection of the part by the transfer slide as it positions the next blank.

Successful operation of this tool assured engineers that the addition of more stages was feasible with only minor modifications. A new cam (to advance the transfer slide a shorter distance) was provided, and feed fingers replaced the nest concept in the new slide design to assure greater accuracy of positioning.

A four-station tool incorporating the new design was constructed for the platform for "grown-junction," alloy and diffused transistors. The part was blanked under the first plunger, then drawn, redrawn and perforated.

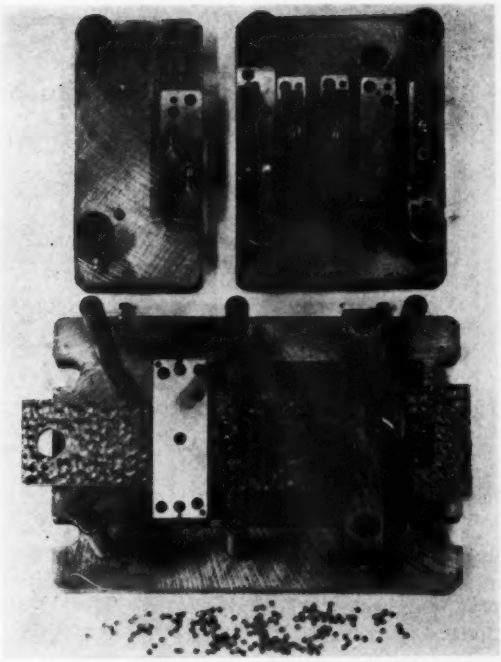


Fig. 1 Six-station punch and die with transistor platforms shown below the die shoe.

Sophisticated Design Follows

The four-stage tool paved the way for other multi-stage tools. Accordingly, engineers began work on an improved design for a tool to produce the platform for another transistor using the transfer press principle. This tool (Figures 1 and 2) has six stations: blank, draw, redraw, size, trim and perforate.

An important improvement in this die design is replacement of the ram-actuated, spring-loaded lifter rods with pins that are cam-actuated to assure positive action. These pins partially raise the incomplete part from the die cavity, and push it into the feed fingers for advancement to the next station.

A slight modification of a larger press was required and Western Electric engineers, in cooperation with the press manufacturer, did the job by adding a shaft beneath the press bed. This shaft is synchronously driven by the transfer slide shaft through miter gears, and carries the cams that actuate the push pins. Production rate is approximately 5000 parts/hr.

Design Facilitates Accuracy

Use of this tooling has simplified maintenance and assures that accuracy will be a function of the

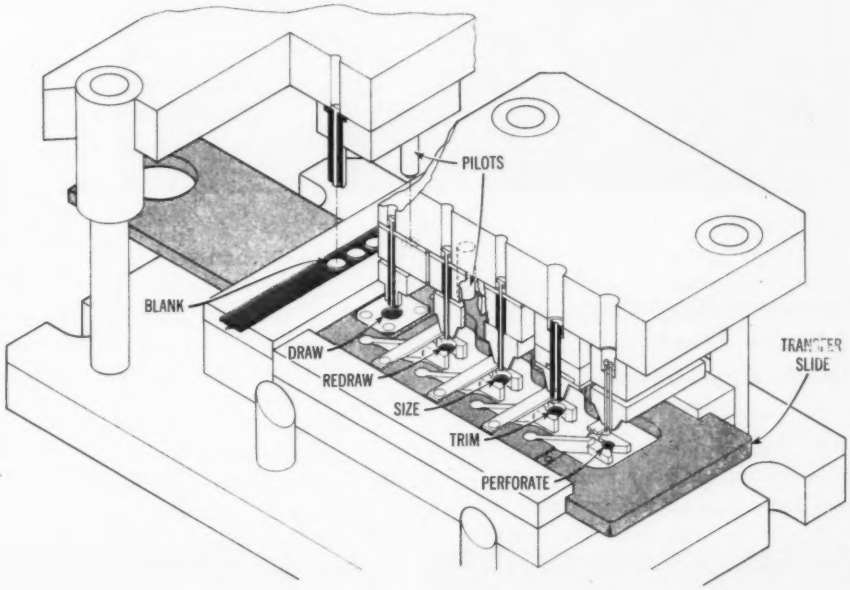


Fig. 2 Progressive operations in the six-station punch and die. Transfer slide, holding parts in various stages of completion, is in right hand position. Blanking punch is ascending as right hand punch descends. Accurate slide positioning is maintained through use of individual pilots that engage a common bushing in transfer slide.

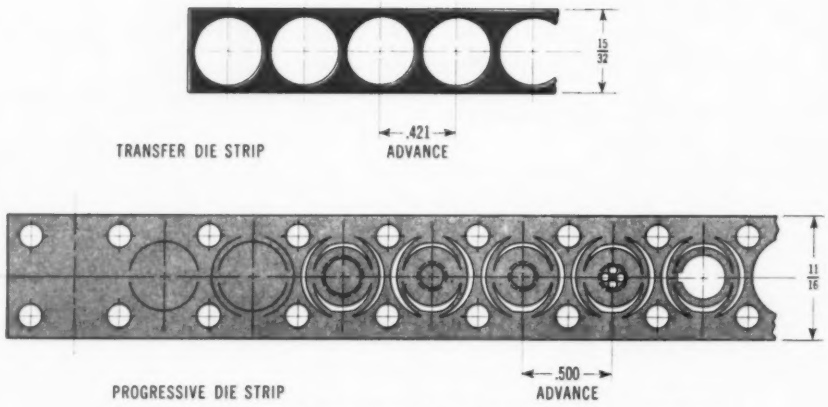


Fig. 3 Comparison of stock strip layouts for the platform used on 16A transistor.

tool rather than related to an elaborate setup. In other words, unlike the tooling for an eyelet machine, which requires that a multiple number of individual stations be adjusted during every setup each time a specific part is to be produced, this new method permits the details to be permanently mounted to a die set.

The proper relationship between stations and the variations in punch lengths (critical in drawing operations) are thus easily maintained because the tool is now a single unit that can be removed from the press without disturbing alignment of the different stations. In addition, the blanking portion of the die can be reground without affecting the other die positions, as opposed to conventional progressive die design where the complete die has to be ground because the stock skeleton moves along the entire die surface.

Illustrative of the savings obtained by the new method is that one operator handles two such transfer presses, where conventional methods would require one operator per machine. Also, use of the transfer die instead of the normal progressive die resulted in a raw material savings of approximately 45% in manufacturing the platform for the 16A transistor (Fig. 3).

Future plans at Allentown include construction of eight-station dies, hopper feeding of parts partially completed on other dies, and application of the transfer principle to other parts now being made on single operation dies. ■

Business Magazine Editors Meet With President

It seems significant that a busy President could meet with business magazine editors in spite of demands on his time. We went away with a better understanding of the problems that face a President. There's more to it than just the question, "Are you pro-business or anti-business?" In a short time we were shown by charts the complexity of the "big picture." It is a big picture and it can't be improved by loggerhead factions.

As you can see, none of us were ready for the picture. Yours truly is second from right in the front row—licking his lips. **WEH, Editor.**

New Annual Award

Finally there's recognition for outstanding contributions to the field of hydraulic or pneumatic power in engineering, research, development, design, sales, production, invention, publications.

The National Fluid Power Association (NFPA) is establishing an Annual Award that will be conferred for the first time in 1962. Said NFPA president William C. Richards, Jr. "The NFPA Achievement Award will enable both industry and fluid power science to recognize those men whose achievements have helped to refine the science and application of fluid power, and to improve industrial efficiency."

Nominations may be made on forms available from NFPA, 5595 N. Hollywood Ave., Milwaukee, Wis. and submitted by April 1962.

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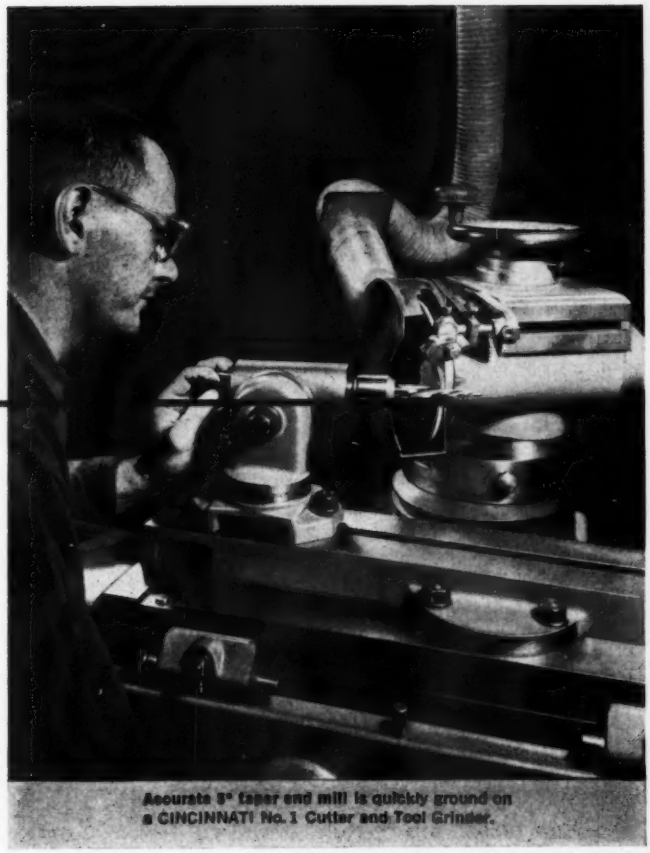

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Why So Many Punch Sizes?

by Harding R. Hugo

Mr. Hugo is a Project Engineer for Dayton Perforators, Inc., of Dayton, Ohio.

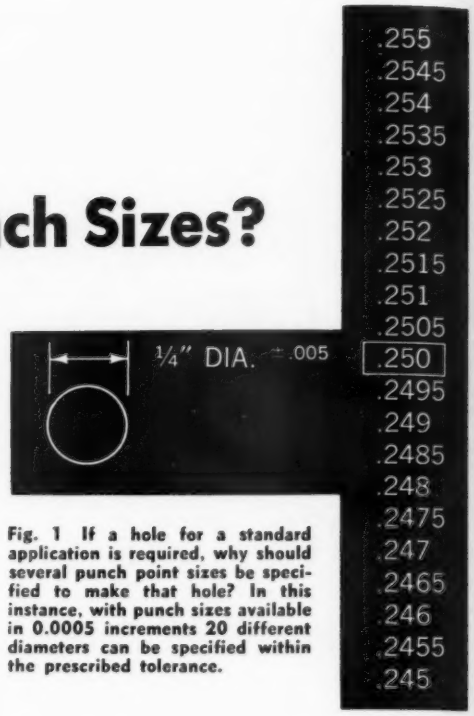


Fig. 1 If a hole for a standard application is required, why should several punch point sizes be specified to make that hole? In this instance, with punch sizes available in 0.0005 increments 20 different diameters can be specified within the prescribed tolerance.

IMAGINE YOURSELF in a situation where in order to write a letter you had to use a different pencil to write each word. Only a No. 13 pencil could be used to make the word "and." Everytime you wanted to write "and," you had to exchange the pencil you're using at the time for the No. 13 pencil, and then exchange that pencil again for another to write the next word. Suddenly the pencil breaks, and because it is a special pencil your letter can't be finished until a replacement is obtained, which may take days or even weeks.

Sound confusing? It is. But even in this modern day of mass-production technology a comparative situation exists with respect to production punches used to make routine holes.

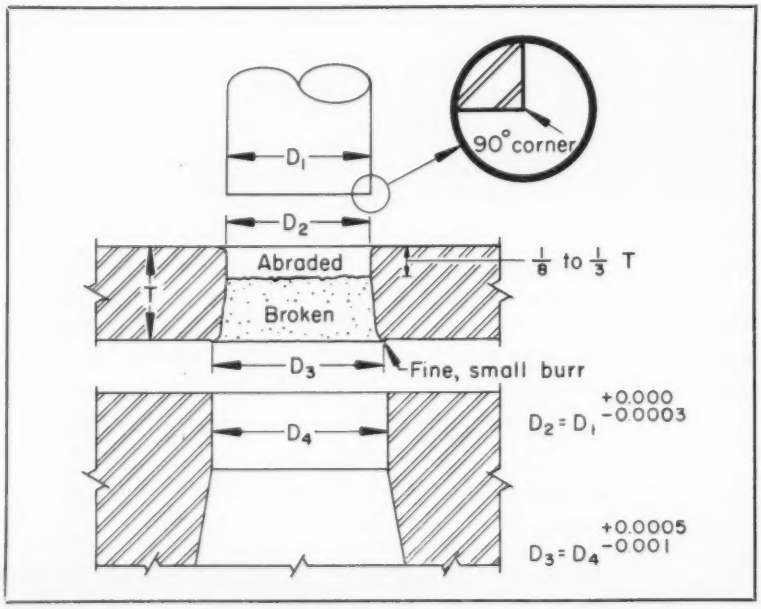


Fig. 2 Hole configuration and dimensions related to punch diameter of sharp or new punch. Fine, small burr and minimum hole closure. Minimum punch penetration and press tonnage required.

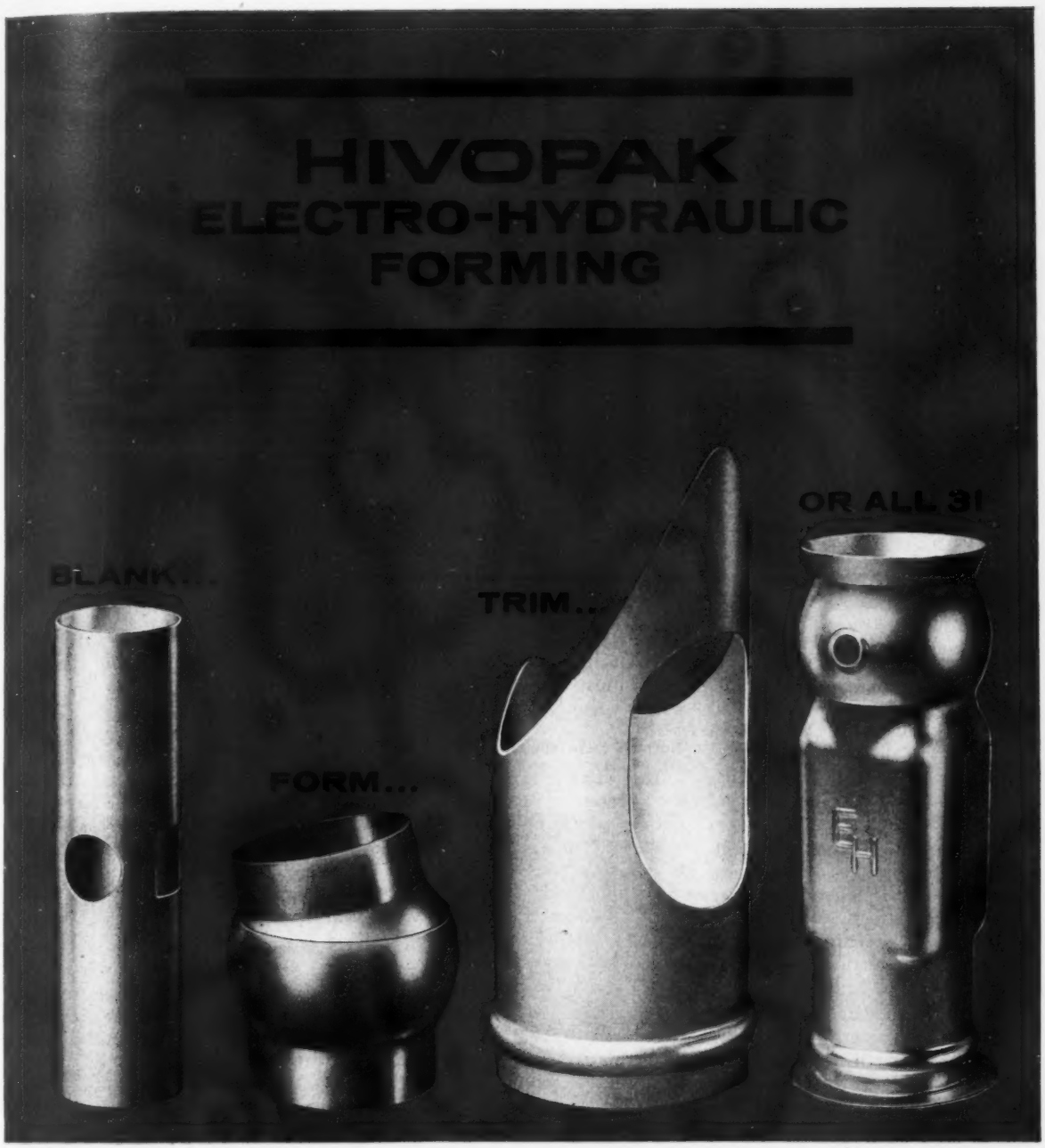
Because of a practice referred to as "high limit sizing of open tolerance holes," many different punches of special sizes are used to make the same standard hole in a production part, even where that same hole size appears again and again.

The question, then, is "if a hole for a standard application is required, why should several punch sizes be specified to make that hole?"

For example, a part drawing calls for a ¼" (0.250) punched hole, ±0.005 to ±0.015. Because of clearance limitations between punch and die, tight hole size control is imperative, and as a result, die building precision must normally use punch size increments of 0.0005.

Thus, within the greater limits established by product engineer-

continued page 62



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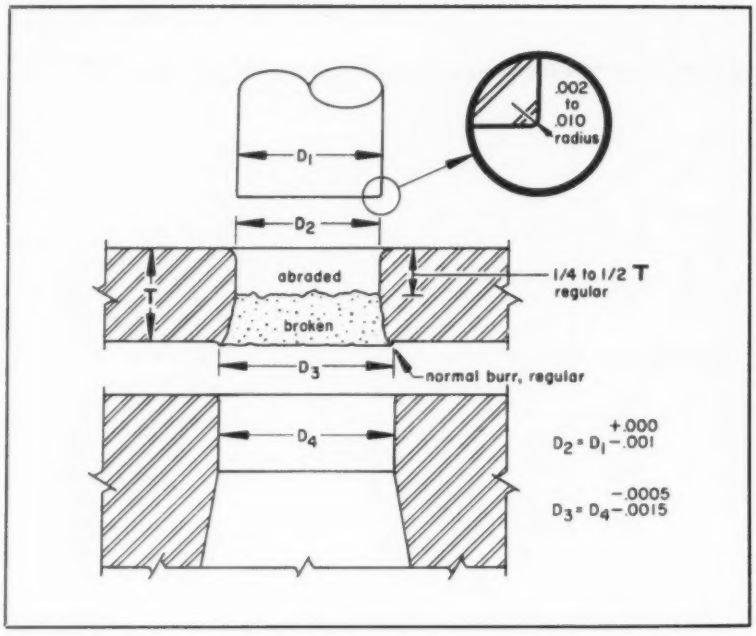

Fig. 3 Normal punched hole dimensions related to punch diameter of suitably sharp punch and die. Normal regular burr and normal punch penetration with normal press tonnage required. Normal working range of sharpness. Punches and dies should be sharpened when cutting edge has worn to a radius of 0.010. This is the normal amount of sharpening grind required for normal maintenance procedures.

ing, any of 20 different punch sizes can be specified for the ±0.005 tolerance, and any of 60 different sizes can be specified within the ±0.015 tolerance. Each of those special diameters can result in a production item which must be stocked . . . just to make a simple ¼" hole, Fig. 1.

This is the condition of "high limit sizing of open tolerance holes"—part hole tolerances larger than ±0.001 which set up situations wherein specific punch sizes for actual production needs will be established by "rule of thumb."

You may say that the generous tolerances are necessary for wear allowance and to provide the greatest latitude in the economical application of the punch and die.

This is pure fiction, because it has been proved, beyond the shadow of a doubt, that wear allowance is not required! Finished diameters of punched holes will vary from full punch diameter, (when punch is sharp), to not more than minus 0.001 when the punch is very dull. This is due solely to hole closure. Running with a dull punch does cause increased burr, part distortion and increased tonnage on the press . . . but not reduced hole size! It is, therefore, unnecessary to allow for wear when specifying the punch size for any given application. Fig. 2, 3, and 4 illustrate what happens to a punch when it becomes dull.

Normal Hole Closure

The apparent contradiction in the preceding paragraph exists only by confusing normal hole closure with hole size reduction due to punch wear. The first statement applies only to hole closure which is the normal condition. The second statement refers only to punch wear or diameter reduction which is not the normal condition.

Hole closure will result whether the punch is sharp or dull. The degree of closure is dependent upon several conditions other than punch sharpness. The physical characteristics of the material being punched, punch-to-die clearance, type of stripper employed, diameter of punched hole, and even the wear land length in the die button contribute in some degree to the hole closure.

With all these variables, the range of hole closure will still be within the limits stated. The minute amount of hole closure is, for all practical purposes, so negligible that it can be ignored. Then, too, commercial punches have a normal tolerance of plus 0.0005, minus 0.0000, and this is sufficient to offset the effect of hole closure.

Stock Compression

A piercing punch "crowds" or compresses the stock around it, and tends to stretch the material in front of it. After the hole has been pierced and the punch withdrawn, the elasticity of the material tends to close the hole. A sharp punch will generally produce a hole with the least amount of hole closure.

The 90° cutting edge deforms the stock at every point around its periphery. Resulting shear stresses in the stock are highly concentrated and fracture readily occurs. Penetration necessary to effect fracture is at its minimum value. The punched hole configuration, illustrated in Fig. 2, has a "compressed" length of 1/8 to 1/3 of the stock thickness. The sharp edge, however, is progressively breaking down with each press stroke.

As the cutting edge breaks down from a 90° corner to a radius, the shear stresses are distributed over a surface rather than an edge, and deeper penetration is required to effect fracture. "Crowding" begins along the radius and the amount of material compressed is, therefore, slightly greater. As the punch

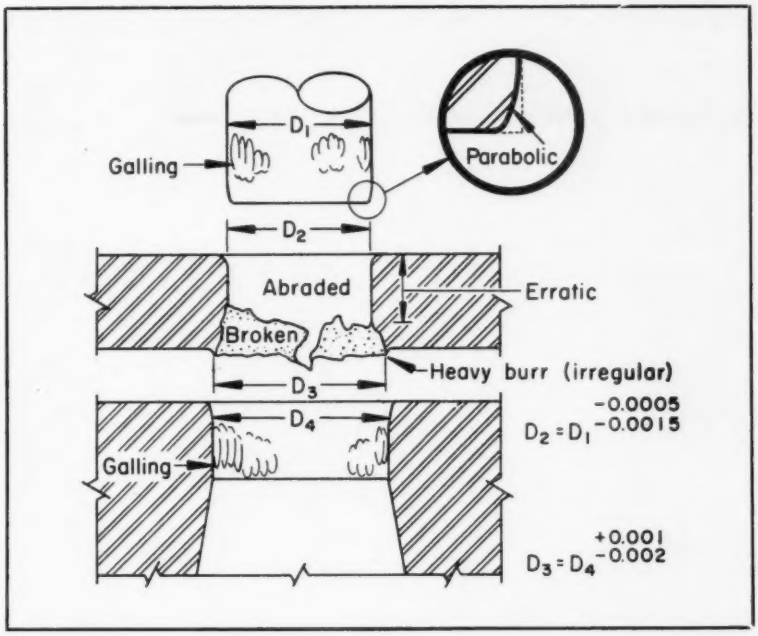

Fig. 4 Part distortion and hole characteristics produced by very dull punch and die. Heavy irregular burr, maximum punch penetration, and maximum press tonnage required. Excessive stock removal when sharpening punch and die.

progressively penetrates the stock, it distributes the excess material over a greater distance; in effect, burnishing the hole, Fig. 3 and 4. The hole edges are work-hardened to some degree. Consequently, not all of the "crowding" or compressive stress is relieved. Thus the amount of hole closure will be within the stated limits.

The most important fact that needs to be emphasized is that the punch diameter need not be increased in order to produce the desired hole. Wear allowance should be provided, however, in length to assure an adequate number of sharpening grinds.

Reduction of diameter by wear can occur after the cutting edge has worn to a parabolic shape, Fig. 4. The punched holes resulting from this cutting edge distortion present too many production problems to be tolerated for any length of time. Removal of the worn cutting edge by sharpening will restore full diameter. Planned maintenance will afford the necessary control.

Open tolerances are not just false economy — they are a sheer extravagance! The price of a single punch is insignificant when compared to the compounding costs of stocking, special ordering, replacing and maintaining a multitude of special punches. Providing those large tolerances, on the theory that it permits the tool engineer and die builder to supply punches at lowest cost, is being penny wise and pound foolish.

Further, the total bill is run up because the exact size of a high-

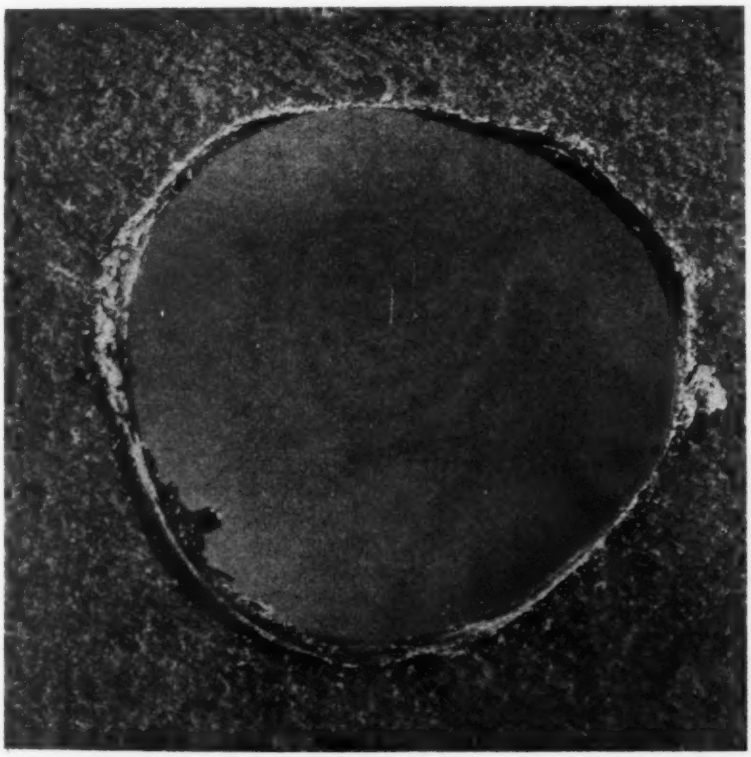

Fig. 5 A drilled hole is always larger than the drill with which it was produced. Larger by 0.002 to 0.005 when well tooled, but larger by considerably more and drastically out-of-round when "just drilled."

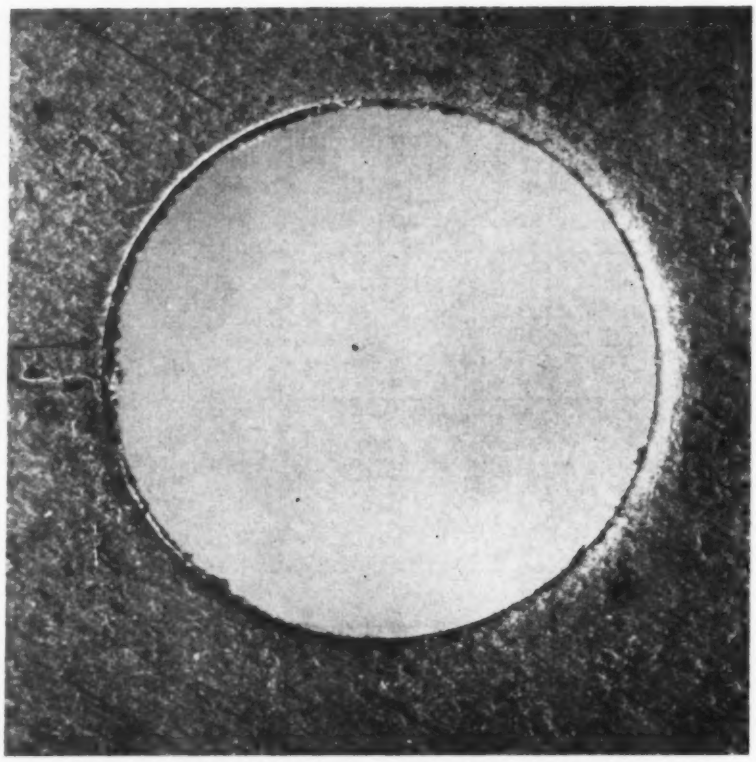

Fig. 6 A punched hole is always round and due to hole closure, is usually 0.0005 smaller than the punch point diameter.

limit punch is not known. When it breaks there is nothing to do but pull the die out of production, remove the punch, "mike" it to find its size, and then set about making or buying a replacement.

To find the answer to the problem, let's go back to where it all started . . . the hole!

The primary consideration in the specification of a punch should be the function of the hole. The hole is the product. It either "fits something" or "clears something," and only one size is necessary for a particular hole to perform a particular function. The actual determination of function and specification of the hole is the responsibility of product design.

But, in trying to interpret the function of a hole in respect to producing it, and to specify it properly for production, product designers have been using poor practice for standardization. One of the most prevalent of these is the practice of attempting to apply drill sizes.

The trouble lies in the fact that a drilled hole is always larger than the drill size with which it was produced — larger by 0.002 to 0.005 when well tooled — larger by considerably more and drastically out-of-round, (Fig. 5) when "just drilled."

However, a punched hole is always round (Fig. 6), and is usually 0.0005 smaller than the punch point diameter. Thus, when using drill sizes and tolerances for specifying a punched hole, large "open" tolerances result, and that's where the confusion starts. Fig. 1 illustrated what happens when open tolerances are applied to a simple hole.

It is at this point that tool engineering has to make a choice of a specific punch size for the hole, and since the choice must be made without knowledge of the hole's function, without proper standardization as a guide but somewhere within the tolerances established by product design, "high limit sizing" occurs, and a multitude of special punch sizes result.

Surprisingly enough, the next time that particular hole is called for, another set of special sizes will probably be specified by another engineer.

Despite the problems, you don't need all those punches!

We have conducted a statistical study over the past several years to analyze punch sizes and applications. Our results revealed that certain standard size punches appear in more than eight out of ten applications, including holes for fasteners such as screws, rivets and eyelets; press or slip-fit rods and shafts; similar holes with plating allowances; clearances for protruding parts and even allowances for manufacturing tolerances that permit misalignment of mating parts.

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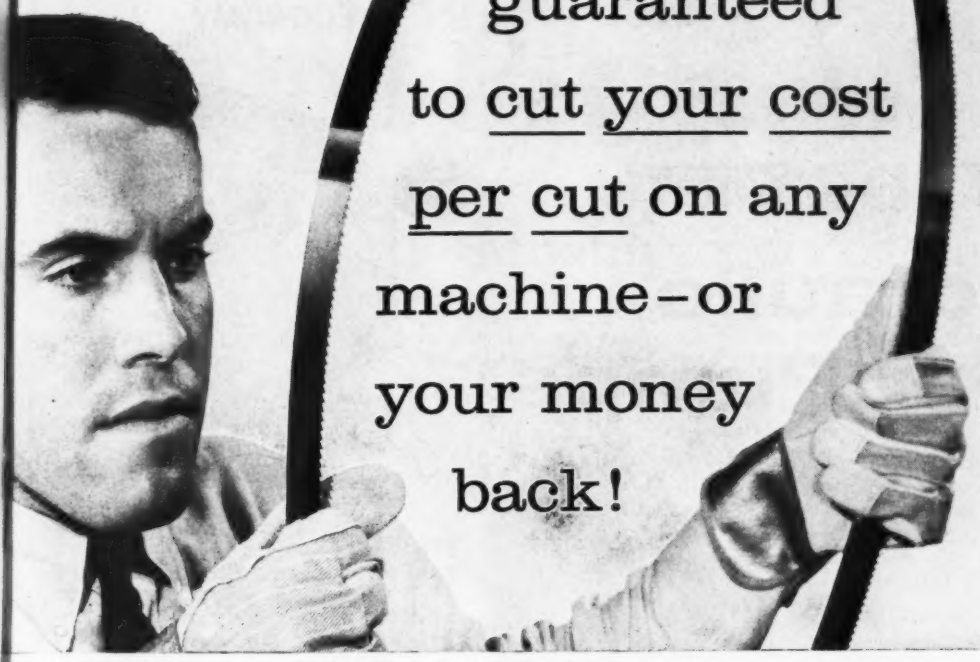

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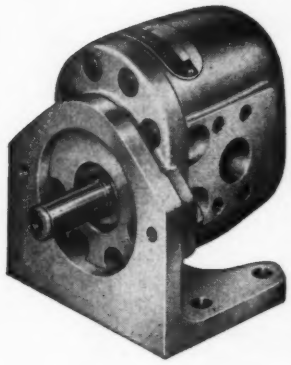

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NIKON OPTICAL COMPARATOR

new model 3A offers unusual screen brightness and image resolution – features zoom-condenser system

The unusual image brightness, definition and accuracy achieved in the new model 3A—to the very edge of the screen—is a credit to the quality and design of its optical system.

The new Nikon model 3A permits surface as well as contour inspection—independently or simultaneously. And controls are provided for adjusting the intensity of each of the illuminators.

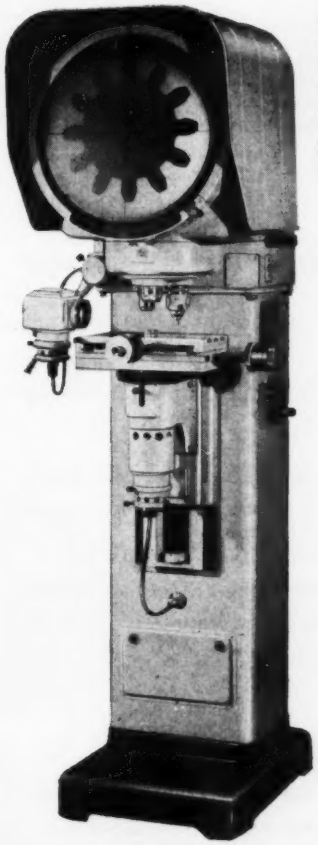
The surface illuminator may be used obliquely to emphasize surface texture. Or, for greater measurement accuracy, the surface illuminator may be used in conjunction with lens-mounted, half-reflecting 45° angle mirrors to provide shadowless light on the optical axis. Contour illuminator employs a special zoom condenser matching system. Convenient control simplifies adjustment for optimum illumination at each magnification.

Model 3A is normally supplied with a choice of one or more standard lenses in magnifications ranging from 10x to 100x. Other magnifications are also available on special order. A 3-lens turret supplied as standard equipment, facilitates instant changes. Focusing is smooth and effortless. Utilizes leadscrew drive with scraped ways and adjustable gibs.

The model 3A is equipped with a sliding hood which may be drawn out to shade the screen, or can be retracted to permit ready access to chart or screen surface. The overall diameter of the screen glass is 14½", designed for use with standard charts.

The new Nikon 3A accepts a wide variety of micrometer stages, holding fixtures, protractor screens, charts, photo attachments, and other accessories. For details write Dept. TP-11.

features new 14" screen



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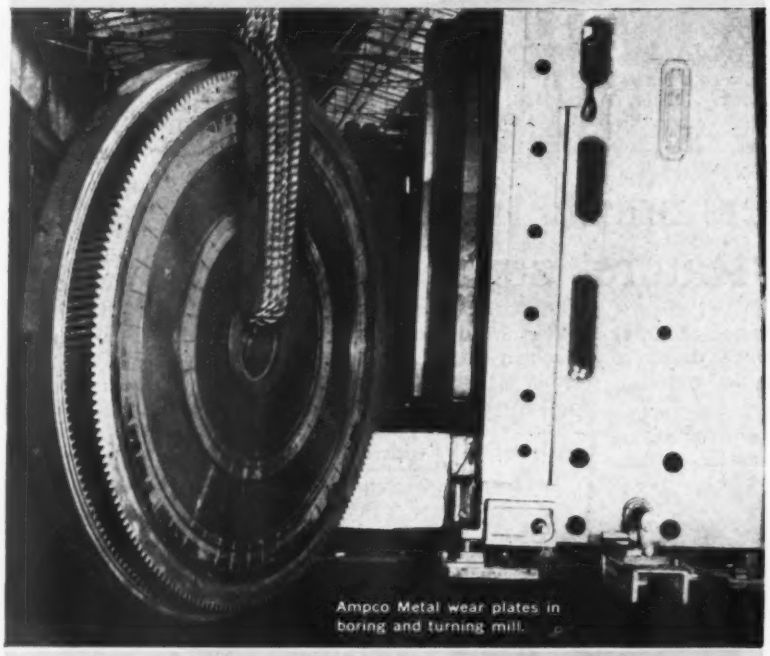
Use AMPCO 8 for ways, slides, gibs, guides, wear plates and strips



Ampco Metal wear plates in boring and turning mill.

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combats metal-to-metal wear

The special structure of AMPCO® 8—further enhanced by special rolling and cross-rolling procedures — withstands high working pressures and shock, resists abrasion, erosion, corrosion, and cavitation-pitting.

Where extremely severe wear (under high compressive loads) and abrasion is encountered, AMPCO® 18 and 21 stock extruded rectangles are available.

Your stock distributor can recommend the grade and form for your application and deliver from stock to your requirements. Write for his name — and Bulletin G-50. 9-63

AMPCO metal

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West Coast Div.: Huntington Park, Calif.
Southwest Div.: Garland (Dallas County), Texas

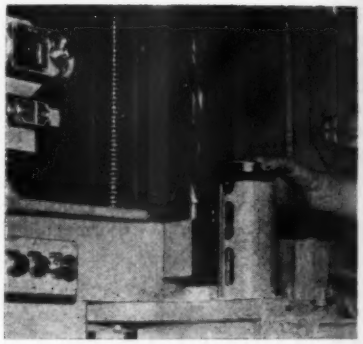
CIRCLE INFORM-A-GRAM KEY NO. 68

Machine Design Yields Broaching Benefits

A refinement in broaching machine design is said to allow reductions in subsequent parts machining plus a 50% boost in tool life because chatter has been eliminated.

Officials of Lapointe Machine Tool Co., Hudson, Mass., say theirs is a "radical departure" from the conventional design of pull-up broaching machines. Their unit uses a pair of matched ball screws to pull the broach, with broach and screws arranged for direct in-line pull. This is the feature they claim eliminates chatter.

J. P. Crosby, a vice president, says Lapointe engineers have eliminated the bending force and losses in the slide ways caused by the cantilever beam effect of the former method. The old way was to drive the slide, which in turn drove the broach.



Parts are fed from a vertical tube

The Lapointe principle uses high-efficiency heat treated ball bearing screws in matched pairs, driving the screws through a gear box. This method transmits power from the gear box directly through the ball screws to the broach, using machine ways and slide only to guide and stabilize the broach.

A unique broach following attachment gives added stability to the broach by guiding throughout the full cutting stroke.

Initial application of the principle has been made in a 72" stroke vertical pull-up machine. Mr. Crosby says that one gear manufacturer plans to eliminate final gear-shaving because this machine's capabilities made it unnecessary.

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or
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Clausing drills out-perform — on continuous production, in the tool room, maintenance shop — every application — because they are built better. Ask your dealer to prove it! And write for literature on the new 20" and 15" models.

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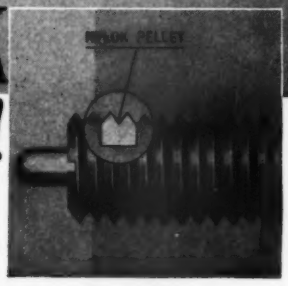
CIRCLE INFORM-A-GRAM KEY NO. 69

NOW all VLIER Spring Plungers are available with NYLOK at no extra cost!



Nylok-fitted bodies are self-locking; eliminate need for checknuts or other secondary locking devices.

Whether you use Vlier Spring Plungers on tooling, or for original equipment applications, you'll like this new self-locking feature.

Each Vlier Spring Plunger body is permanently fitted with a tough, resilient nylon pellet which slightly protrudes above the major thread diameter. As the plunger is inserted in the tapped hole, this pellet is *compressed* (not cut), exerting a spring-like pressure on one side of the plunger body. This *constant* lateral thrust wedges the mating threads together, assuring a *positive* lock that remains vibration-proof regardless of cyclic loads.

PERFECT FOR USE WHERE PERIODIC ADJUSTMENTS MUST BE MADE—The self-locking feature is effective whether the body is seated or not, permitting the Vlier Spring Plunger to be easily and accurately adjusted as required...cannot back off or be shaken loose once set.

RE-USEABLE MANY TIMES—When the Vlier Spring Plunger is removed, the Nylok pellet strives to return to its original shape. Parts can be used numerous times before any locking pressure is lost.

NO EXTRA COST FOR SELF-LOCKING FEATURE—All standard Vlier Spring Plungers are now available with the self-locking feature at no increase in price! However, all models may still be ordered without Nylok.

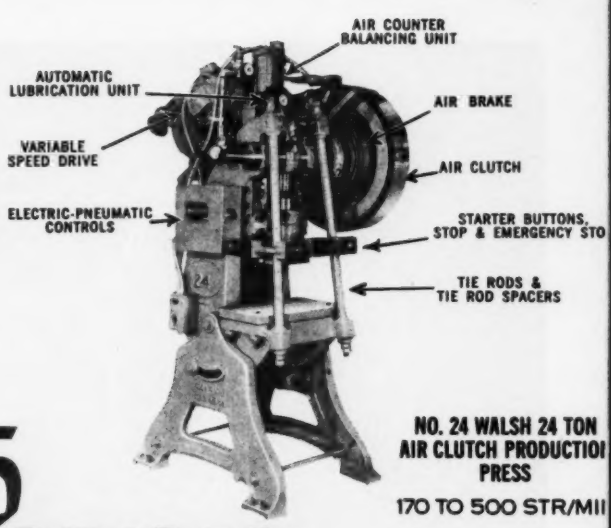
Your Vlier distributor now has Nylok-fitted Vlier Spring Plungers on his shelf. Order a supply today.

VLIER
Engineering Corporation
A subsidiary of Barry Wright Corporation
8900 Santa Monica Blvd., Los Angeles 46, California

CIRCLE INFORM-A-GRAM KEY NO. 70

Walsh Presses have 35 construction features, not all of which are found on any one press. Send for new literature describing these features which have made Walsh Presses "Rugged as the Rockies" since 1907.

WALSH PRESSES 35 DESIGN FEATURES



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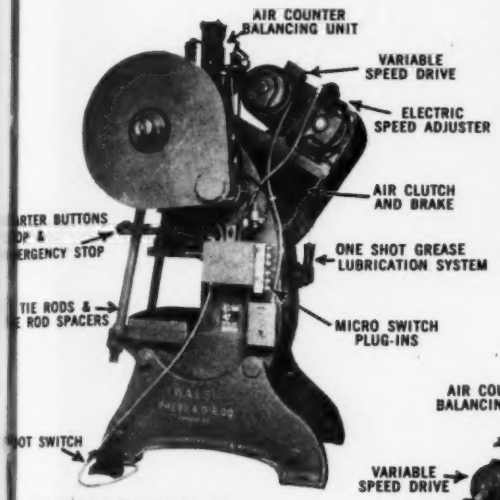

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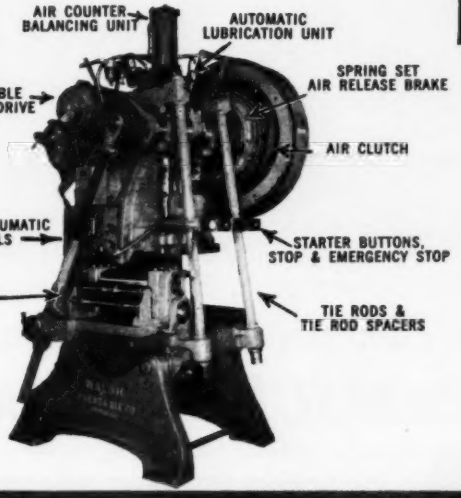

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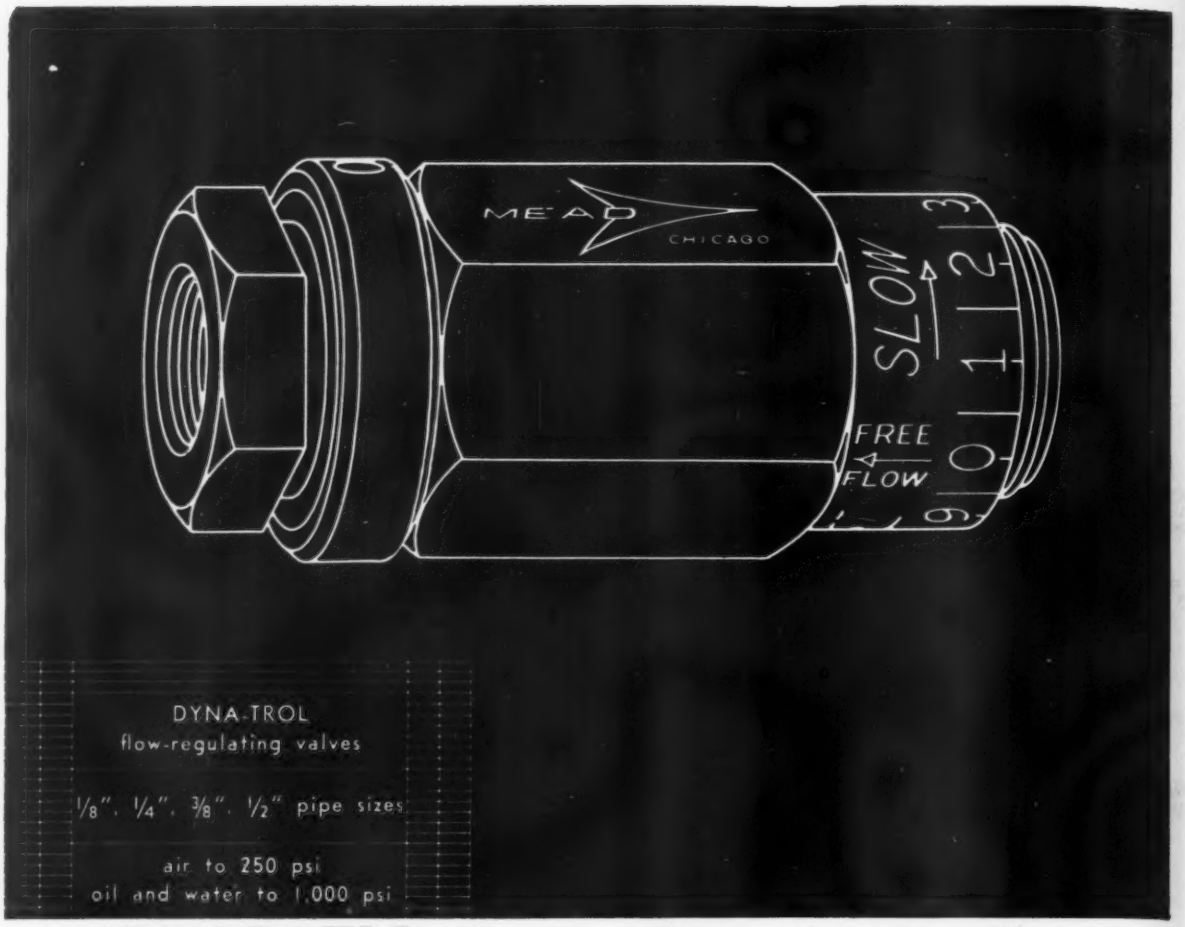

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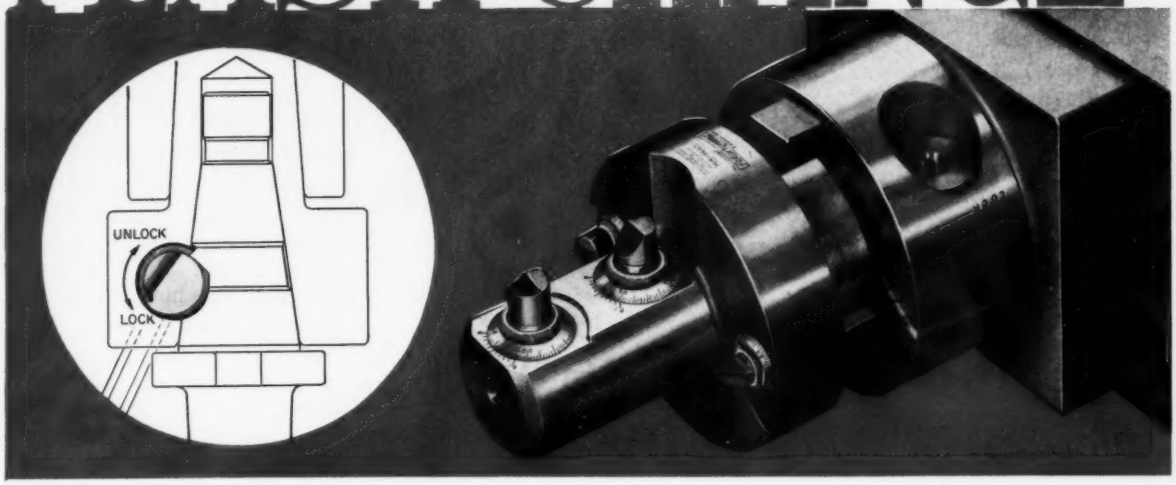
microbore the precision cutting tool system with FLASH-CHANGE®



Patented Flash-Change is another exclusive MICROBORE feature. It's DeVlieg's own system of quick change tooling for all makes and types of boring machines, milling machines, turret lathes and automated equipment. The system consists of a Flash-Change tool holder to suit the individual machine spindle and MICROBORE tooling with Flash-Change taper shanks. Clockwise rotation of an eccentric cam in the tool holder locks the cam into an NMTB taper socket in the tool shank. A counter-clockwise motion unlocks and ejects the tool. Tooling is interchangeable from one machine to another or can be reused in the same machine without resetting. Write for complete information on Flash-Change and other developments of the MICROBORE system of precision tooling.

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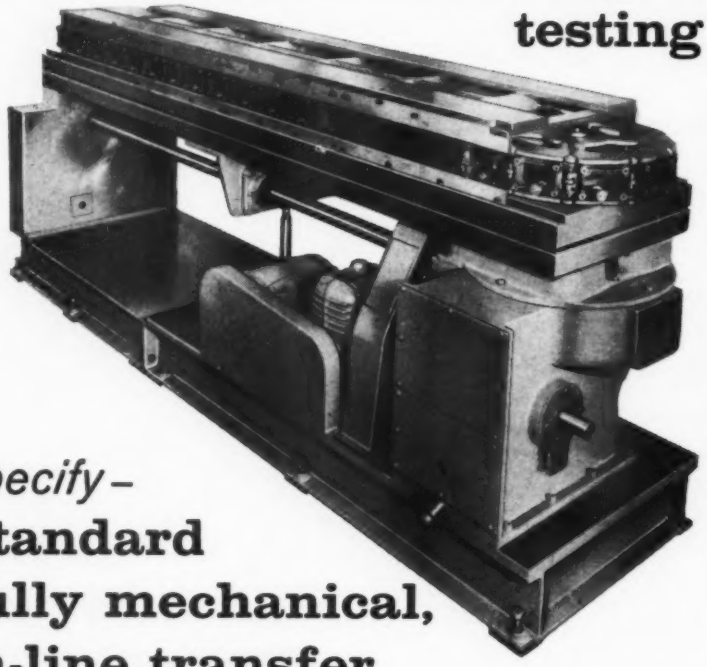
for vital cost reductions in automatic assembly & testing



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Standard Tool also manufactures a complete line of cam operated Rotary Indexing Units . . . and other standard machine components.

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Write for bulletins No. 19 and No. 26 for complete engineering specifications.

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Better Products at Lower Cost through Better Methods

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Calendar of Events

October 29-November 1 National Metal Trades Association Convention, Hotel Commodore, New York, New York.

November 1-3 Industrial Engineering & Management 25th Anniversary, Pick-Congress Hotel, Chicago, Illinois.

November 18 9:30 A.M., Society of Carbide Engineers' Annual Meeting, Belmont Plaza Hotel, New York, N.Y.

November 15-17 NMTBA's 60th Annual Meeting, Americana Hotel, Bal Harbour, Fla.

November 26-December 1 ASME Winter Annual Meeting, Statler-Hilton Hotel, New York, N.Y.

Text Treats 'Total Quality Control'

TOTAL QUALITY CONTROL (ENGINEERING AND MANAGEMENT), by A. V. Feigenbaum. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y., 1961, 627 pages, $11.00.

"Product quality . . . is rapidly becoming the most significant factor in customer decisions . . . whether the purchaser is a housewife, a large industrial corporation or a military procurement agency." So says the author of this comprehensive work, who is manager of manufacturing operations and quality control for General Electric Co., and who also serves as president of the American Society for Quality Control.

Mr. Feigenbaum maintains that the purpose of his book is to review the total field of QC as a body of technical, analytical and managerial knowledge. Among the ways he says the text may be used are these: as a guide for those establishing a QC program for the first time, as a survey for industrial managers in appraising the potentialities of the QC function.

The volume is conveniently divided into six parts: business quality management, QC management, engineering technology of QC, statistical technology of QC, applying total QC in the company, and QC education and training.

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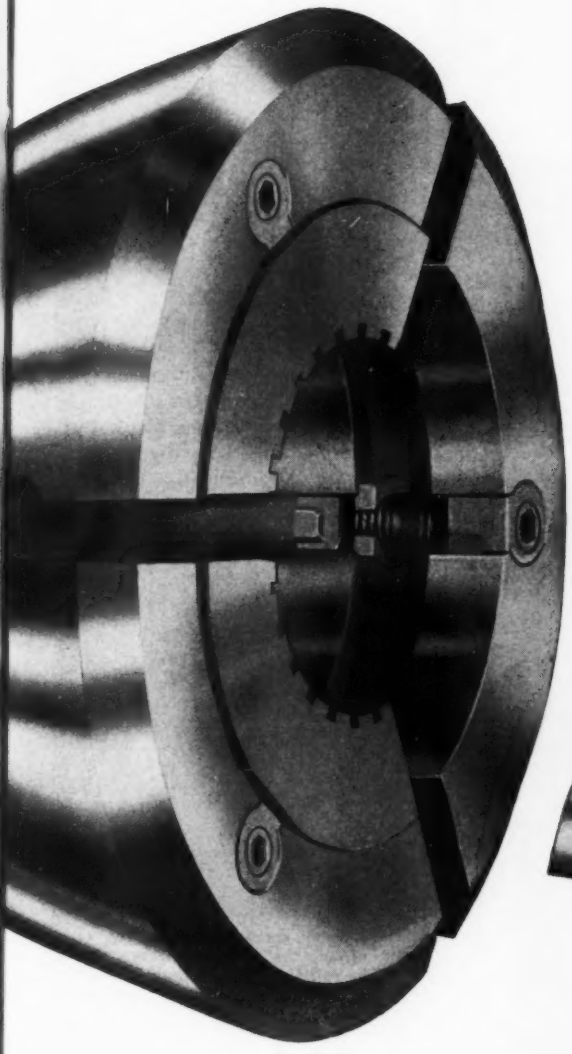

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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

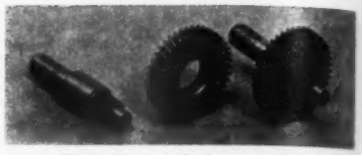
Gears and Shafts Joined in Jig Time

Piecemeal work on gears and shafts—heat treating at one location and assembly at another—is no longer a problem at Stanley Electric Tools Div., The Stanley Works, New Britain, Conn. The firm has combined the two operations in one machine, with substantial savings in time.

The gear and shaft assemblies go into such tools as electric drills and power sanders. Two typical assemblies, both handled by the same tooling, consist of a gear, 1¾" OD x ½" thick, fitted to a previously machined shaft.

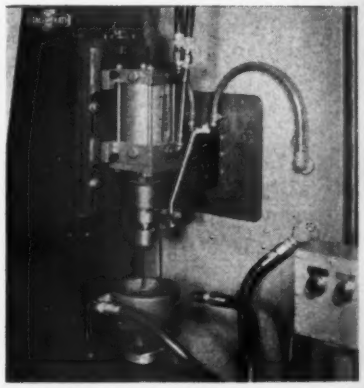
The assembly machine heats the gear teeth to below root diameter, press fits the gear on the shaft, quenches the assembly, and then tempers the gear teeth from a minimum hardness of R_c 55 to R_c 40-45.

Heat power is provided by a Cincinnati 30 KW Radio Frequency Inductron. Versatile and easily changed tooling combines an induction heating coil and water quench ring centered between two vertical spindles to support the shaft. The lower spindle is belt-driven by a variable-speed motor; the upper is a live center mounted on an air cylinder shaft. Tooling is mounted on a column set in a tank to catch quenching overspray.



Typical gear-shaft assembly.

The operator hand loads the assembly, slipping the shaft between spindles, with the gear riding loosely on the shaft, and centered in the coil. When he presses the start button, shaft and gear begin to rotate and the heat cycle starts, heating the gear teeth evenly and slightly expanding the blank. During the heating cycle, the air cylinder is automatically actuated, pressing the shaft into the gear.



Machine components are, top to bottom, the air power press with live spindle, the RF induction heating coil and quench ring, and the lower drive spindle.

At the conclusion of the heating cycle, the quench cycle begins, followed immediately by a reheat cycle at a lower power level to temper the teeth to the required hardness. After tempering, spindle rotation stops and the air cylinder relaxes so that the completed assembly can be removed. Total cycle time for the smaller gear assembly is 7 sec, for the larger 12 sec. No subsequent straightening is needed in the assemblies.

rugged Logan / 14" LATHES

To withstand the terrific strain of metal-machining, a lathe must be rugged—*real* rugged. Logan lathes are. Solidly built headstock features large oversize spindle and ball bearings. Rugged carriage has double-walled apron, large tool post, and heavy-duty compound rest assembly. Extra-heavy duty tailstock provides rigid support for work. Wide, machine-cut change gears are made of "Ductile Iron." They have as much as triple the strength of some cast iron gears, and tensile strength superior to most steel change gears. The 10" x 56" lathe bed is another example of Logan ruggedness. Oversize ribs and balanced sections of even thickness effectively neutralize internal stresses. Lathe's capacity (14⅝" swing over bed, 9" swing over saddle, and 28" center distance) combined with ball bearing variable speed drive of 40-1400 rpm (no stopping to shift belts), makes Logan the best dollar value in the lathe field. Complete information on request.

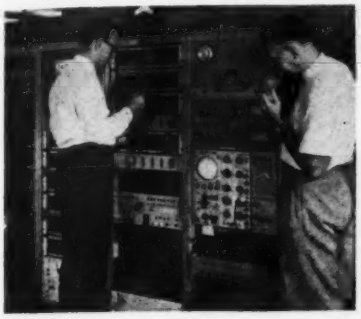
MODEL 6510
$1,775.00
F.O.B. FACTORY

Logan
LOGAN ENGINEERING CO.,
4901 W. Lawrence Ave., Chicago 30, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 78

Conditioned Response

Wisdom, confined to the human realm, has been defined as knowing what to do next. Now a machine is so nearly human that it has wisdom in its grasp. Cybertron, built by Raytheon Co., knows what to do next. It tackles a problem for which no formula is known. By conditioned response or trial and error, it relates new situations to past experience.



In industry the unit should be at home in quality control and inspection. It could sort, grade, and reject parts that move along a conveyor belt.

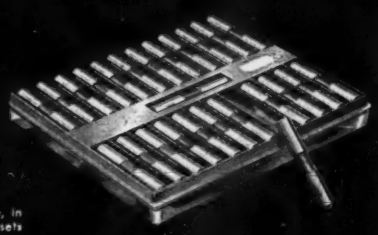
Cybertron figures out its own method of attack, gives the answer, and can tell how it arrived at the solution. The unit learns from being exposed to data or experiences on specific fields. It modifies what has been learned and stores new data in its memory unit. It absorbs all it needs to know on each experience in seconds. If it makes a mistake in learning, the teacher pushes a "goof" button. The machine then re-evaluates its method and adjusts its memory content.

One of its attributes is that it does not get bored with repetition, as a person is apt to. Cybertron thrives on recurrence, continually refines its learning and betters performance. Once it has mastered a particular task, its know-how can be transferred to an AIDE (adapted identification decision equipment). This is a simpler, more compact machine that can perform a task, but cannot do any further learning.

The Cybertron unit is not a computer. It uses punched tapes for learning and for memory.

CIRCLE INFORM-A-GRAM KEY NO. 79

GAGING IN TENTHS? HERE'S CERTIFIED "X" ACCURACY, OFF-SHELF DELIVERY, 3,000 SIZES!



ALL SIZES .038 - .2050 IN STOCK IN TENTHS! 25-GAGE TENTH SETS NOW IN DRILL SIZES, #1-61, AND IN 64ths FROM 3/64" THRU 1".

$1.58 per gage, in 25-gage sets under .3750"

$39.40 25-gage sets under .3750"

DELTRONIC

CLASS "X" - PLUS .000,040" - MINUS .000,000" • PRECISION LAPPED APPROXIMATELY 1 MICROINCH FINISH • LENGTH - 2¼", 2½", 3", 3½"

BLUE CHIP CUSTOMERS

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Certification of Accuracy

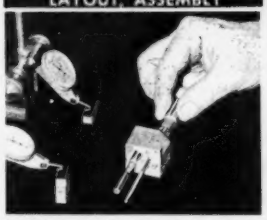
DELTRONIC CORPORATION unconditionally guarantees each gage herein to be within a size tolerance of plus .000,040", minus .000,00"; surface finish approximately one microinch; both ends concentric to one another. All Master Gages in our plant are calibrated semiannually or oftener, with standards traceable to the National Bureau of Standards, Washington, D. C.

Inspected by 235

RELIABILITY is assured through continuous checking and surveillance of all Deltronic production and inspection facilities by MetroLonics, an Independent Metrology Laboratory, with standards uninterruptedly and directly traceable to the National Bureau of Standards, Washington, D. C. To maintain the most exacting requirements of precision measurement, all gaging standards used in manufacturing of Deltronic gages are calibrated and certified quarterly . . . MetroLonics also completely checks samples of each and every Deltronic production run.

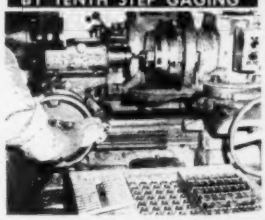
INSPECTION Electronic gaging equipment, accurate to ten millionths or better, is used for all measurement. Roundness is checked on a Talyrond with spindle runout guaranteed to one millionth accuracy. A polar chart showing roundness of a production-run Deltronic gage is reproduced at left. Final lapping, grinding, and inspection performed in Deltonic's plant is in temperature-controlled rooms, maintained within standard 68°, plus or minus one-tenth of 1°

IDEAL FOR HOLE LOCATION, LAYOUT, ASSEMBLY



Manufacturer of Missile Components: "Used on measurement of precision servo devices which use highly precise gears, and whose center distances are extremely critical and must be maintained accurately. Also indispensable as assembly accessories for lining up gear boxes' bores. Tenth step gaging resulted in 30% saving on production-measurement and inspection of hole-spacing. Replaced standard plug gages and dial bore gages used formerly."

PRODUCTION SPEEDED BY TENTH STEP GAGING



Machine Tool Manufacturer: "With the .0001" steps, the operator knows at all times exactly what diameter the hole is and is able to correct his setting accurately. The short length of the Deltronic gage versus dial bore, or standard gage with handle, enables a much shorter backout. With the positive indication of size provided by the Tenth Step system, a savings of nearly one minute was effected on each part, and the gage set paid for itself on this one run."

INSPECTION SIMPLIFIED WITH VARIETY OF SIZES

Electronics Manufacturer: "Particularly desirable was the low initial cost and the availability of a wide range of sizes in tenths for immediate use, thus making rapid production, drill jig and inspection fixture checking easier. All of these factors resulted in substantially saved time and much greater product reliability than was possible prior to using the Deltronic Gaging system in this precision gaging work."

PRICES OF SETS, AND NOMINAL SIZES IN STOCK

FRACTIONAL SETS

Complete coverage of every fractional size from 3.64ths thru 1", in 1/64th" increments.

PRICE LIST - FS64-A, B, C SETS

FS64-A - 1/64" thru 3/8" $45.00
FS64-B - 25/64" thru 5/8" $41.50
FS64-C - 41/64" thru 1" $74.50

25-GAGE TENTH SETS

Nominal size, + and — 12 tenth steps. Set #TP25 consists of nominal gage with 24 additional gages. Twelve gages range upward from nominal in .0001" steps each. Twelve gages range downward from nominal in .0001" steps each.

PRICE LIST - TP25 SETS

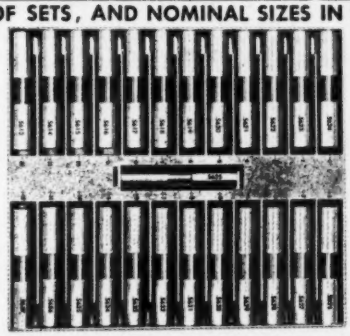
Nom. sizes .039 thru .3750 ..... $39.40
Nom. sizes .3775 thru .4270 ..... $43.80
Nom. sizes 41/64" thru 1" $52.20

"HALF-THOU-SETS"

Each set consists of a nominal size gage, plus 11 or 23 gages ranging upward, from nominal gage in .0005" steps . . . Nominal size coverage from .038" to .626" scheduled for production, in nominal size increments of .006", starting at .038"

PRICE LIST HT12, HT24 SETS

Nominal sizes	HT12	HT24
.038 thru .280	$23.90	$39.40



DRILL-SIZE SETS

Complete coverage of all number drill sizes, economically, for quick and accurate reference

PRICE LIST - DS61-A, B, C, SETS

DS61-A - 1 thru 20 ..... $41.00
DS61-B - 21 thru 40 ..... $41.00
DS61-C - 41 thru 61 ..... $43.00

9-GAGE TENTH SETS

Nominal size, + and — 1, 2, 5, 10 tenths. Set #TP9 consists of nominal gage with eight additional gages. Four gages range upward from nominal .0001", .0002", .0005", .0010". Four down from nominal, .0001", .0002", .0005", .001

PRICE LIST - TP9 SETS

Nom. sizes .039 thru .3750 ..... $19.60
Nom. sizes .3775 thru .4270 ..... $22.40
Nom. sizes 41/64" thru 1" $29.80

THOUSANDTH STEP

Each set contains one nominal gage, plus 12 gages ranging upward from nominal in .001" steps, and 12 gages ranging downward from nominal in steps of .001", total of 25 gages in each set.

PRICE LIST - TH25-25 SETS

TH525-.250 thru .350 ..... $39.40

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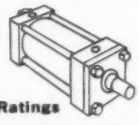
Modern straight thread leak-proof ports for easily positioned fittings are available at no extra cost on hydraulic cylinders.

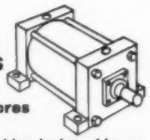
HYDRAULIC CYLINDERS



Two Pressure Ratings

2000 psi (3000 psi non shock), the famous heavy duty Hannifin Series "H" in 1½" to 12" bore.
1000 psi, Series "L", 1" to 8" bore, Hannifin quality in a lighter cylinder. Full compliance JIC Hydraulic Specs.

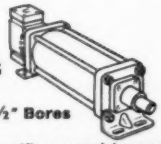
AIR CYLINDERS



1½" to 14" Bores

Series "A"—steel heads, honed brass body for corrosion resistance. Hardened and hard chrome plated piston rod. For all heavy duty air service. Easily modified for water service. Full compliance JIC Pneumatic Specs.

AIR MOTORS



1¾" to 4½" Bores

New from Hannifin, a complete power package combining cylinder and solenoid valve. Only one air line connection. Four mounting styles. Interchangeable mounting dimensions for most applications.

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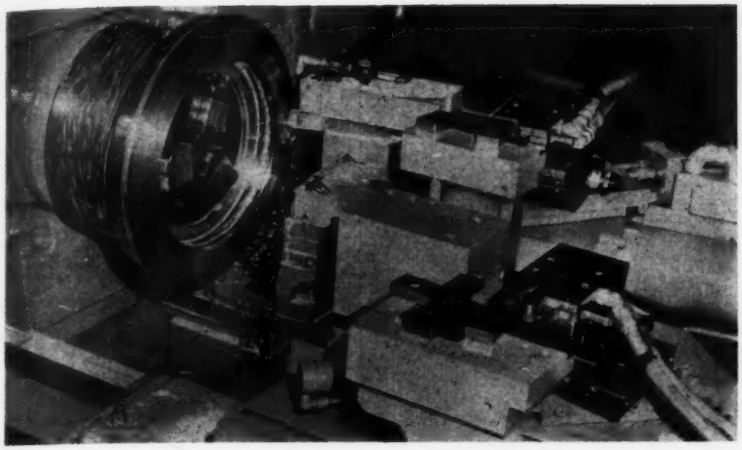

Two hydraulic tracer conversion systems rejuvenated this obsolete standard lathe.

Tooling Rejuvenates Obsolete Lathe

Here's a part that loses 26 lbs in 6 min, thanks to two imaginative tooling tricks. One is a double hydraulic conversion tracer arrangement applied to a standard lathe that allows the work to be approached with cutting tools on two sides simultaneously, and the other is tool design, which permits tools to double up on cuts, i.e., each tool can make cuts in two directions.

The workpiece is an 18" dia, 120-lb forged steel ring gear blank that's completed in one roughing and one finishing pass on a standard lathe that was considered obsolete before being tooled this way for longer life. This up-dating has completely changed gear processing procedures at this Midwestern plant of a heavy earth-moving machinery producer. The double hydraulic tracer arrangement was designed and produced by Detroit Broach & Machine Co., Rochester, Mich.

Efficient Cutters

Combined with the new tool design, it allows just two cemented carbide cutters brazed to straight shanks to turn seven separate operations.

It has allowed a six-spindle machine and its operator to be freed for other work. It has eliminated better than a day's tooling-up time on the 6-spindle automatic (previously required only for roughing) when changing from one gear blank size to another. Where three different machines were formerly needed to completely machine each gear blank, now only two machines do the work in about the same total time previously needed just to complete the finishing operation.

Machining the AISI 4140 steel forging calls for turning an angle face of the 18" part and cutting the radius and front of this face; on the opposite side—turning the radius, boring the inside diameter, facing the web and chamfering the bore.

Third Machine Eliminated

Previously, one machine was used for back facing and boring as a preparatory operation. This was followed by a roughing operation on the multi-spindle automatic, then finishing on a third machine.

Today, two machines handled by one operator do the same work. The operator merely transfers gear blanks from the first-operation machine to the converted lathe, which completes the work. All seven operations are done by the second machine within the time the first machine completes preliminary facing and boring.

In the double hydraulic tracer conversion arrangement, the two systems are tied into a single control center. Both tracer setups are mounted 90° to the lathe spindle, allowing the front and rear units to approach the work from each side simultaneously. They are mounted to clear the lathe bed sufficiently for ample retraction in loading and unloading.

With the double system, the front tracer enables its cutting tool to turn the back angle of the gear blank, do the radius and front face angle at the same time the rear tracer is guiding its cutting tool (on the opposite side) in turning the radius, boring the inside diameter, facing the web and chamfering the bore.

Work Conditions

Machining is done at 200 sfpm for both roughing and finishing. The two steel grade carbide cutting tools employed are fed into the work at a constant rate of 0.015 in making both straight-in and side cuts. The feed rate is controlled automatically by the two hydraulic tracer systems at all times.

The heaviest cuts taken by the tools are ¾" on the initial approach in the draft angle of the gear blank web area, and ⅜" to complete the web face.

The cutting tools are mounted in adjustable tool blocks. The stylii and templates always remain in the same relationship to each other, even when templates are changed for different gear sizes.

Changeover time from one gear blank size to another is less than an hour. Changing of the two templates, adjusting the tool block, and replacing the spindle's expanding collet is all that's required. Since the same cutting tools are used, they remain undisturbed.

The new setup enables the company to handle gear blank sizes of 6 to 24" dia. ■

Now . . . you can get a locknut that is made to the same high quality standards as famous Allen socket screws. True to its name, the LOKON nut locks on a companion threaded member with a can't-shake-loose grip . . . holds indefinitely against heaviest impact and vibration. Because the basic design allows adequate deformation of the "turret top" without overstressing any portion of the periphery, "LOKONS" are highly resistant to fatigue failure. And, through closely controlled heat treatment, a degree of elasticity is achieved which permits re-use time after time without significant impairment of the locking action.

LOKON locknuts assemble fast and easy . . . start with finger spinning . . . tighten smoothly . . . lock at any point as soon as the threads in the elliptical section are fully engaged, and are readily removed without damage to the nut or mating part.

Check the EXTRAS you get in "LOKONS" . . . features that add up to extra value without extra cost!

✓ Consistent uniformity in dimensions . . . in strength . . . in spring tension; ✓ Built-in flange saves washer cost, speeds assembly; ✓ One-piece, all-metal construction; ✓ No parts to become lost or damaged, nothing to deteriorate; ✓ Fully formed hex corners for sure-grip wrenching; ✓ High-grade alloy steel, heat treated; ✓ Class 3B threads; ✓ Meet performance requirements of specification MIL-N-25027.

ASK FOR TEST SAMPLES — Test LOKON locknuts on your product and discover the many ways these high quality fasteners can save you assembly time and cut costs. Currently offered in sizes from No. 10 through ½", UNC and UNF threads. Other sizes available soon. And for prompt delivery, call your nearby Allen Distributor who carries full stocks of "LOKONS" as well as dependable Allen hex-socket screws.

ALLEN THE ALLEN MANUFACTURING COMPANY HARTFORD 1, CONNECTICUT PLANT AT BLOOMFIELD, CONNECTICUT WAREHOUSES IN CHICAGO, CLEVELAND, LOS ANGELES

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OUR EXCLUSIVE PROCESS (BBFPG) RESHARPENS DULL FILES to new file effcy. No acids or annealing, and does not change original temper or hardness. Length determines cost to resharpen all dull files—Amer. & Swiss Patt., incl. flexible blades.
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DIE SETS

Provide

Smoother Action

Maximum Pin Surface Hardness

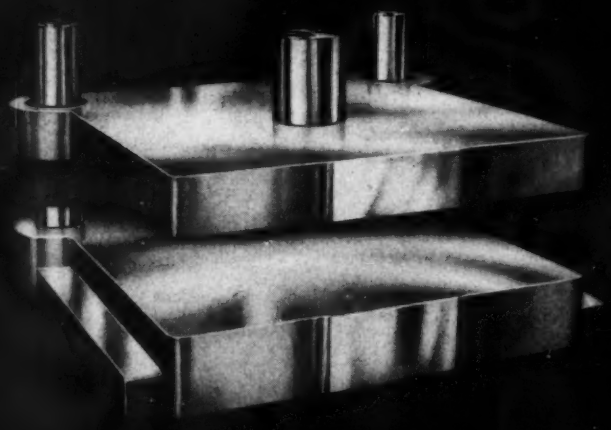
Increased Pin Bearing Surface

Longer Pin and Bushing Life

Greatly Reduced Possibility of Pin Scoring

With

Superfinish
GUIDE PINS



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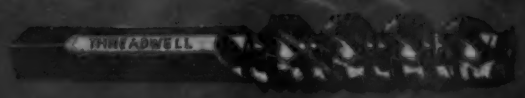
Only TURBO-CUT by Threadwell has a full 3-4 thread plug chamfer!



Benefit? Turbo-Cut's longer chamfer distributes the load over more teeth and breaks up chips to minimize tap breakage. Turbo-Cut's longer chamfer makes tapping easier and cleaner on through holes, does a one-pass job on blind holes. Only Threadwell makes the genuine Turbo-Cut with the longer chamfer.
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6	19	32	68	81	97	1012	1071	1112	1153	1202	1241	1284
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8	21	34	70	84	131	1032	1073	1114	1161	1211	1243	1292
9	22	35	71	85	133	1033	1074	1121	1162	1212	1244	1293
10	23	36	72	87	134	1051	1081	1122	1171	1213	1261	1294
11	24	37	73	88	821	1052	1082	1131	1172	1214	1262	1295
12	25	38	74	89	822	1053	1091	1132	1173	1221	1263	1296
13	26	40	75	90	961	1054	1092	1133	1181	1222	1271	1297
14	27	59	76	91	962	1061	1093	1134	1191	1223	1272	

EDITORIAL ITEMS

C1	C11	C21	C31	C41	C51	C61	E2	P4	P14	P24	P34	P44
C2	C12	C22	C32	C42	C52	C62	E3	P5	P15	P25	P35	P45
C3	C13	C23	C33	C43	C53	C63	E4	P6	P16	P26	P36	P46
C4	C14	C24	C34	C44	C54	C64	E5	P7	P17	P27	P37	P47
C5	C15	C25	C35	C45	C55	C65	E6	P8	P18	P28	P38	P48
C6	C16	C26	C36	C46	C56	C66	E7	P9	P19	P29	P39	P49
C7	C17	C27	C37	C47	C57	C67	E8	P10	P20	P30	P40	P50
C8	C18	C28	C38	C48	C58	C68	P1	P11	P21	P31	P41	P51
C9	C19	C29	C39	C49	C59	C69	P2	P12	P22	P32	P42	P52
C10	C20	C30	C40	C50	C60	E1	P3	P13	P23	P33	P43	P53

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C5	C15	C25	C35	C45	C55	C65	E6	P8	P18	P28	P38	P48
C6	C16	C26	C36	C46	C56	C66	E7	P9	P19	P29	P39	P49
C7	C17	C27	C37	C47	C57	C67	E8	P10	P20	P30	P40	P50
C8	C18	C28	C38	C48	C58	C68	P1	P11	P21	P31	P41	P51
C9	C19	C29	C39	C49	C59	C69	P2	P12	P22	P32	P42	P52
C10	C20	C30	C40	C50	C60	E1	P3	P13	P23	P33	P43	P53

Which article in this issue interested you most? _____

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with spring-loaded retractable blade give precision-cut edge or chamfer at high speed without chatter

Adjustable spring tension allows continuous contact with work-piece to eliminate chatter at high operating speeds. Free-floating blade permits self-alignment and uniform stock removal. Made in a full range of sizes to 1½" diameter.

Blades of the Universal R & R Deburring Tool are made of high speed steel, precision hardened and ground to close tolerances for interchangeability. May be used as horizontal deburrer in portable electric drill or in standard drill press.

For full information, write to Universal Engineering Company.

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CIRCLE INFORM-A-GRAM KEY NO. 85

How to cut your disposable-tooling costs by 30 per cent at no sacrifice in quality or output. (Answer is on the next page.)

With the new Carb-O-Lock toolholder-insert combination. The single most important advance in the whole history of metal-cutting.

Save 30 per cent when you buy it. Save 40 per cent when you use it.

These are minimums. Users of the Carboloy Carb-O-Lock toolholder-insert combination have reported savings many times higher. Why?

Simple. The Carb-O-Lock design is simple. Using a cam-action locking principle, the Carb-O-Lock has just three parts (not including insert). Insert changing and indexing is a breeze; parts inventories can be held to absolute minimums. Streamlined design lets you bring the toolholder closer to your work. And less overhang means less vibration, less insert chipping and breaking.

Plus: the Carb-O-Lock gives you proven performance. A major diesel engine manufacturer discovered Carb-O-Lock allowed nearly triple the feed, eliminating two machines. A locomotive and car equipment company found Carb-O-Lock's simple, rugged design reduced time for tool changes and permitted maximum horsepower utilization.*

Carb-O-Lock inserts are available now in Grade 883 for machining cast iron, as well as many operations on the following materials: high-temperature alloys, type 300 stainless steel, brass, bronze.

So start your savings program today. Phone your Authorized Carboloy Distributor and order your Carb-O-Lock toolholder-insert combination. Save 30 per cent. And more.

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CARBOLOY CEMENTED CARBIDE BLANKS AND DISPOSABLE INSERTS • BRAZED TOOLS • TOOLHOLDERS • CARBIDE DIES • WEAR PARTS

CIRCLE INFORM-A-GRAM KEY NO. 87

T&P Catalogs & Literature

A new tool supply catalog is offered by Reid Tool Supply Co. It's yours for circling Inform-A-Gram No. C1.

Dynamic and static balancers are cataloged in a 20-pager from Gisholt Machine Co. Mark Inform-A-Gram No. C2.

High speed steel reamer and drill blanks produced by Ace Drill Corp. are specified in a catalog from the company. Inform-A-Gram No. C3.

All Hannifin Co. air power presses are cataloged in new consolidated Bulletin 0960-B1. Interested? Circle No. C4.

Grinding Jobs Large or Small

ELB Tables Take Them All

ELB

A complete line of high precision SURFACE GRINDERS

Your choice of 35 models, ranging from 6" x 12" x 7¾" to 59" x 197" x 39½". Models with proportionately wide tables, especially suited for tool and die work are available; these machines are capable of taking almost any grinding job, regardless of size.

Model	Grinding Width	Grinding Length
Jewel	6"	12"
Brilliant	10"	18"
S W	12"	24"-47"
S W B	20"	24"-197"
S W D	25½"	59"-197"
S F	29½"	79"-197"

ELB features.

• Fully automatic work cycle • Easy operation • Functional design • Increased output due to widest cross feeds (up to 2⅜" per table stroke) • Profile grinding with 4" wide grinding wheel • Automatic copying grinding • Automatic sizing equipment • Automatic return of wheelhead to starting position.

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Write for illustrated brochure and address of nearest showroom.

ALINA CORPORATION

122 East Second St., Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 88

Reamers, end mills, counterbores, tool bits, and cutoff blades are included in a new 48-pager from Besly-Welles Corp. Circle Inform-A-Gram No. C5.

Four from G & L

Gidding & Lewis Machine Tool Co. is offering the following free literature:

Bulletin D-42 describes three sizes of 8-position indexing toolholders for vertical boring and turning machines. Circle Inform-A-Gram No. C6.

Standard and special arbors, and sleeves for use in shank-mounted tools, adjustable drawkeys, box-type angle plates, open-side V blocks, stud and T-nut sets, adjustable stop jacks, and many other Davis tooling and setup accessories are mentioned in Catalog D-540. Yours on Inform-A-Gram No. C7.

CF continuous feed heads for boring, facing, turning, backfacing, recessing, threading, grooving, grinding, and other work are the subject of Catalog D-550. Inform-A-Gram No. C8.

L-type car wheel boring tools are described in Catalog D-560. Circle Inform-A-Gram No. C9.

A new drill set folder covers high speed steel drill sets for general purpose and industrial applications. It's yours from Ace Drill Corp. on Inform-A-Gram No. C10.

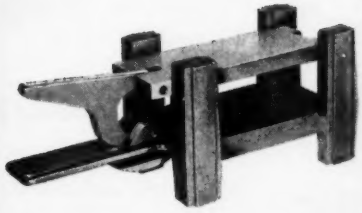
Catalog 6103 describes Vascaloy-Ramet Corp.'s throw-away insert face mill cutters for rough, semi-rough and finish milling. It's yours on Inform-A-Gram No. C11. Catalog 6104 covers the company's Rigidcut and Varicut inserted blade milling cutters. Circle Inform-A-Gram No. C12.

Profilometer instruments for measuring surface roughness are outlined in a general catalog from Micrometrical Mfg. Co. Check Inform-A-Gram No. C13.

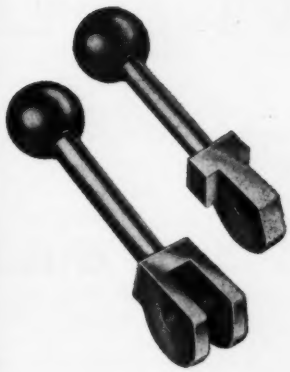
Lathe turrets, Micro-Set adjustable centers, and Tiny-Titan magnetic base tools are outlined in a catalog from Enco Mfg. Co. Inform-A-Gram No. C14.

"Anocutting," the modern electrolytic machining technique, is extolled in a new booklet from Anocut Engineering Co. Inform-A-Gram No. C15.

LONG TRAVEL CLAMPS



LEAF JIGS



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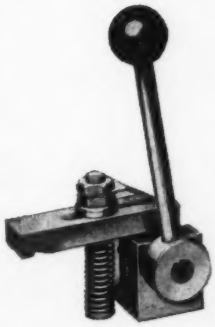


AUTOMATIC CAM CLAMPS

WESPO can show you 1170 ways to cut Jig and Fixture costs!

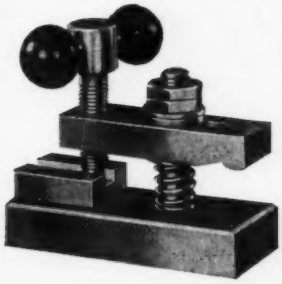
Wespo catalog No. 12 lists more than 1170 *standard* jig and fixture components—everything from simple c-washers and straps . . . to automatic cam clamps . . . to precision leaf jigs. Since components are usually a significant part of the total cost of a jig or fixture, use of standard components can result in appreciable savings, as well as hurry completion of the jig or fixture.

So, before you take the time and trouble to machine costly, custom fixture hardware, look in your Wespo catalog, or check with your Wespo distributor. Chances are you'll find just the component you need as a Wespo *standard*.

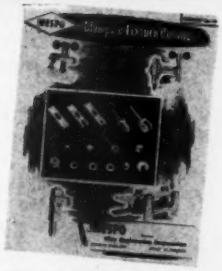
"C" WASHERS

STRAPS

HAND KNOBS



CLAMPS



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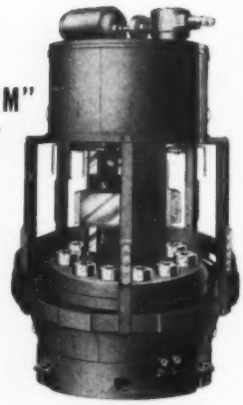

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Available with 6, 8, or 12 spindles.

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Day-in and day-out — they are proving their ability to produce more in less time — thereby reducing the cost per piece.

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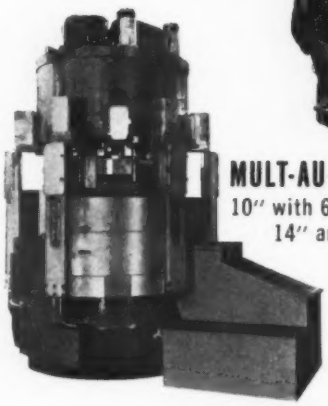

MULT-AU-MATIC, Type "L"
10" with 6, 8, 12, or 16 spindles, 14" and 18" with 6 or 8 spindles.

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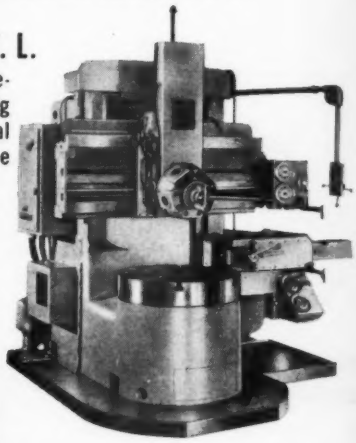
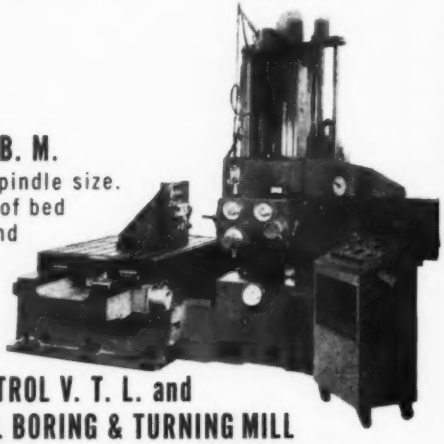
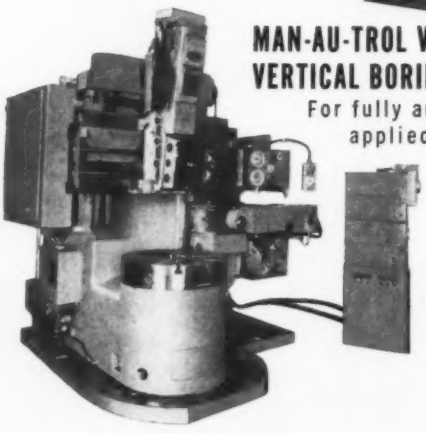
26" to 86" in 10" increments. Discrete positioning or contouring numerical control system can be applied.





DYNAMILL H. B. M.
In 3", 4", and 5" spindle size. Many combinations of bed length, table size and vertical travel.



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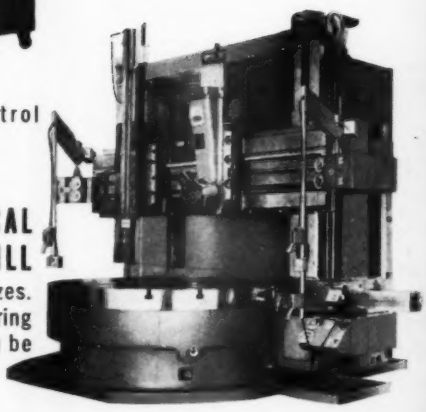
For fully automatic operation, can be applied to any or all heads of Dynatrol at time of ordering or at later date.



DYNATROL VERTICAL BORING & TURNING MILL
108", 124", and 144" table sizes. Discrete positioning or contouring numerical control system can be applied.

CIRCLE INFORM-A-GRAM KEY NO. 90

Catalogs . . .

Advantages and tooling applications of Microbore-Kendex tooling for general purpose precision boring operations are mentioned in Brochure MSD-101 from DeVlieg Machine Co. Inform-A-Gram No. C16.

Three series of junior and intermediate size mechanical press brakes for 50, 65, and 90-ton capacities are covered in Bulletin JI-61 from Verson Allsteel Press Co. Inform-A-Gram No. C17.

Havir Mfg. Co.'s new all steel 25B, 25-ton Auto-Press is the subject of a new catalog. Circle Inform-A-Gram No. C18.

Case histories of actual installations of 6- and 8-spindle automatic hydraulic turret drilling machines are included in a new catalog from Burgmaster Corp. Inform-A-Gram No. C19.

"Strain Recording with Brush Direct Writing Recorders" is the title of a booklet from Brush Instruments, Div. Clevite Corp. Inform-A-Gram No. C20.

The new adjustable press overload detector from Di-Matic Controls, Inc., for use with their 100 or 200 series press controls, is described in a bulletin from the company. Inform-A-Gram No. C21.

Hannifin Co.'s 200 psi Series C air power cylinder is described in Bulletin 0220-B1, available on Inform-A-Gram No. C22.

RX45 Catalog Sheet 738 is a supplement that provides essential information on the all new Tool Mfg. Co. milling machines Wilton Tool Mfg. Co. milling machines vise and the new push-pull drill press vise. No. C23.

Series 70 fixed base OBG presses in 45 to 60 ton capacities is covered in Bulletin 21 from Minster Machine Co. No. C24.

The new Star double-jet gun drills from Star Cutter Co. are extolled in Catalog Sheet SC-169. Inform-A-Gram No. C25.

A conversion chart listing identical jig and fixture components manufactured by twelve companies is offered by Northwestern Tools, Inc. Chart is to aid purchasing men in bulk orders of component parts. Inform-A-Gram No. C26.

A bulletin from Steuby Mfg. Co. tells all about the new Gen-A-Cam generator. Circle Inform-A-Gram No. C27.

The Excel portable power metal cutting bandsaw is described in Bulletin 159EX from Covel Mfg. Co. Inform-A-Gram No. C28.

Digital process controllers for industrial counting, measuring, indicating, and control applications are described in Bulletin 201-A from The Louis Allis Co. Inform-A-Gram No. C29.

Syntron Co.'s 14 standard pulsating magnet models of electric vibrators are covered in Bulletin 81461. Mark Inform-A-Gram No. C30.

"Economics of the V-Band Coupling" is the title of Booklet SDP-2 from Aeroquip Corp. Inform-A-Gram No. C31.

Dial indicating groove gages for O-ring and snap ring grooves are outlined in a catalog from Reliant Gages, subs. Boice Gages, Inc. Inform-A-Gram No. C32.

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LOWER PRICES . . . MORE COMPLETE COVERAGE . . . NEW STANDARD STYLES!

CIRCLE INFORM-A-GRAM KEY NO. 91

Catalogs . . .

Four basic miniature power tools as well as handpieces from grinding, deburring, drilling, sanding, polishing, and cutting are extolled in a catalog from Foredom Electric Co., Inc. Inform-A-Gram No. C33.

Circling Inform-A-Gram No. C34 will bring you a brochure from The Leon J. Barrett Co. Its subject is a 100% air-powered centrifugal enameler.

Indexing units are the subject of Bulletin 26 from Standard Tool & Mfg. Co. Check Inform-A-Gram No. C35.

Dayton safety mounted wheels and points for offhand and precision grinding are offered in a bulletin from Simonds Worden White Co. on Inform-A-Gram No. C36.

All lines of bearings and bearing specialties from Bearings, Inc. are outlined in a booklet. Inform-A-Gram No. C37.

A—Hardened Ways and Slides
B—Composite Die Sections
C—Heel Block
D—Center Clad
E—Flange Slide
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NEW SHAPES—12 cross sections.
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LOWER PRICES—production in large quantities enables us to price them below yours or other makes.
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THE OHIO KNIFE CO.
CINCINNATI 23, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 92

Pressure snubbers that provide instrument protection, steady average pressure readings, and increased instrument life are the subject of "Chemiquip Porous Metal Pressure Snubbers" folder. Chemiquip Co. Inform-A-Gram No. C38.

A table of grades and suggested uses for Trulap diamond abrasive lapping compound and diamond powder has been issued by Wheel Trueing Tool Co. Inform-A-Gram No. C39.

The entire industrial retaining ring line with dimension tables, engineering specifications and mechanical drawings is contained in Catalog 61, a 24-pager from Industrial Retaining Ring Co. Inform-A-Gram No. C40.

Catalog 604 on Kommercial punches and dies from Dayton Perforators, Inc. is offered on Inform-A-Gram No. C41.

Vibratory feeders, mechanical hoppers, air and electric accessories, and vibratory tracks are among the automation devices for industry offered in Catalog 101A from Automatic Feeder Co. Inform-A-Gram No. C42.

Minute Man broaches, hexagon, round and special ones, are the subject of a colorful new catalog from The duMont Corp. Check Inform-A-Gram No. C43.

Michigan Tool Co.'s Bulletin X60-B covers the new optical polygon for checking alignment and angular spacing in any multiple of full degrees. Circle Inform-A-Gram No. C44.

"Advanced Trends in Electric Gaging" is a booklet from Hamilton Watch Co. It explains the function of Hamilton electric indicator and control units. Inform-A-Gram No. C45.

Selecting air and hydraulic cylinders by size, thrust, bore, stroke, and mounting will be easier with Bulletin AJH-104S from the Miller Fluid Power Div., Flick-Reedy Corp. Inform-A-Gram No. C46.

A manual entitled "Shop Guide for Apprentice Training," is offered at $2.50 each, by National Tool, Die & Precision Machining Assn., 907 Public Square Bldg., Cleveland 13, Ohio. They offer a free descriptive bulletin of the Shop Guide. Write Direct.

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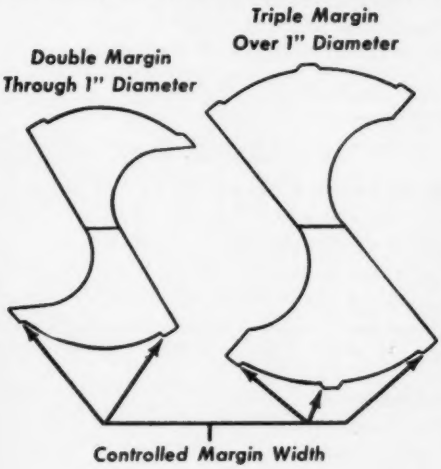
Surface Treated, 118° Point

ALL PRECISION MADE DRILLS are milled and ground BETWEEN CENTERS to ASSURE ACCURACY



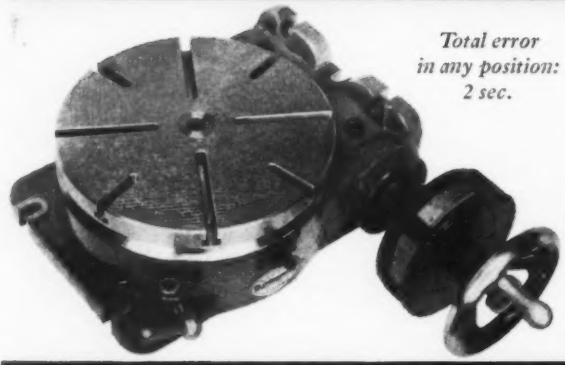
Send for your copy of the new PM Brochure

Mohawk TOOLS, Inc.
MONTPELIER, OHIO

MOORE ROTARY TABLES

For angular spacing jobs so precise you could never handle them before

NO. 2 ULTRA-PRECISE TABLE:
Reads direct to 1 sec.



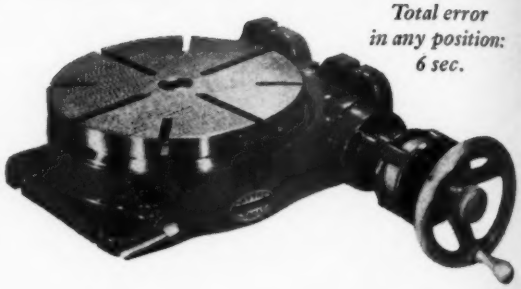
Total error in any position: 2 sec.

GUARANTEED POSITIONING ACCURACY FOR SHOP USE

All points in 90° increments, from zero to ± 1 sec.
All points in 18° increments, from zero to ± 1½ sec.
All points in 2° increments, from zero to ± 1¾ sec.
Worm accuracy—¼ sec.
Repetition of settings—½ sec.
Total error in any position—2 sec.
2 sec. = 0.00005" (½ tenth) on 10" dia.

CATALOG No. 1230UP

NO. 2 PRECISION TABLE
Reads direct to 5 sec.



Total error in any position: 6 sec.

GUARANTEED POSITIONING ACCURACY FOR SHOP USE

All points in 90° increments, from zero, ± 1½ sec.
All points in 18° increments, from zero, ± 2 sec.
All points in 2° increments, from zero, ± 4 sec.
Worm accuracy—2 sec.
Repetition of settings—1 sec.
Total error in any position—6 sec.
6 sec. = .00015" (1½ tenths) on 10" dia.

CATALOG No. 1230P

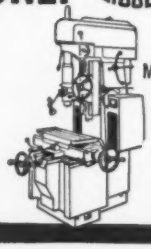
GENERAL SPECIFICATIONS OF BOTH TABLES

- Steel Table Top parallel to base within less than .0001"
- Accurate in horizontal or vertical (90°) position
- Conical surface on edge of table graduated in degrees
- Fine setting is read on satin-chrome dial and vernier
- Center bushing runs true to .00015" T.I.R.
- Thread ground worm is non-disengageable—thereby preventing any loss of accuracy due to raising any bumps or burrs
- Dia. of working surface ..... 10⅞"
- Height in horizontal position ..... 4½"
- Height in vertical position ..... 14 1/16"
- Height of axis of rotation with table in vertical position ..... 7⅞"
- Size of tee slots ..... ⅜"
- Weight ..... 125 lbs.
- Supplied with:
  - Lifting handle
  - Calibration Chart
  - Index Attachment Assembly, Including:
    - 1—Index Plate with 48, 39, 35, 19, 17 and 11 holes
    - 1—Blank Index Plate

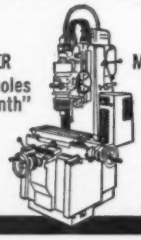
For more information write for illustrated literature

MOORE SPECIAL TOOL CO., INC., 726 Union Avenue, Bridgeport 7, Conn.

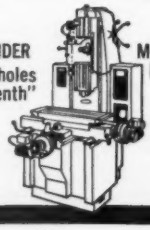
ONLY MOORE TOOLS CAN OFFER THIS COMPLETE PACKAGE OF PRECISION



MOORE No. 3 JIG BORER
Locates and bores holes to less than a "tenth"



MOORE No. 3 JIG GRINDER
Locates and grinds holes to less than a "tenth"



MOORE UNIVERSAL MEASURING MACHINE
Measures to one-third of a "tenth"

MOORE ROTARY TABLE
Divides the circle to less than 2 sec.

CIRCLE INFORM-A-GRAM KEY NO. 94

Catalogs . . .

Descriptions and full price information are contained in a 44-pager from Thermolyne Corp. Subject matter includes electric furnaces, hot plates, temperature controllers, pyrometers, and magnetic stirring hot plates. Inform-A-Gram No. C47.

Automatic Switch Co. has issued catalog sheets on its 2, 3, and 4 way solenoid valves. Inform-A-Gram No. C48.

Technical information, specifications, drill thrust charts, tapping-threading data, typical circuits and applications of automatic drilling and tapping units are all incorporated in a 32-pager from Hypneumat, Inc. Inform-A-Gram No. C49.

"Transfer Presses" is the title of a handy booklet from Baird Machine Co. It covers four models. Inform-A-Gram No. C50.

Chicago-Allis Mfg. Corp.'s new catalog expounds pneumatic and hydraulic packings. Inform-A-Gram No. C51.

Michigan Tool Co.'s Roto-Flo Model 1026 radii finisher is the subject of a data sheet from the company. No. C52.

Automatic oilers, chain oilers, dispensers, single and multiple valves, mist systems, industrial fuses and fuse accessories all from Trico Fuse Co. are covered in Catalog 61, Inform-A-Gram No. C53.

A full case history on expansion fitting as a time saving assembly procedure is contained in a booklet from Cincinnati Sub-Zero Products. Inform-A-Gram No. C54.

A 32-pager from Bardahl Mfg. Corp., 1400 N. W. 52nd St., Seattle 7, Wash., tells the basic principles, properties, types and rules for choosing lubricating grease. Write direct.

"Reference Manual for Steel Equipment 488" is now available from Equipto, detailing shelving, sorting files, drawer cabinets, etc. Inform-A-Gram No. C55.

Power-O-Matic 60 saturable reactor industrial batch ovens are highlighted in a bulletin from Blue M Electric Co. Inform-A-Gram No. C56.

Twenty pages tell much about multi-station automatic assembling and processing machines from Swanson-Erie Corp. Circle Inform-A-Gram No. C57.

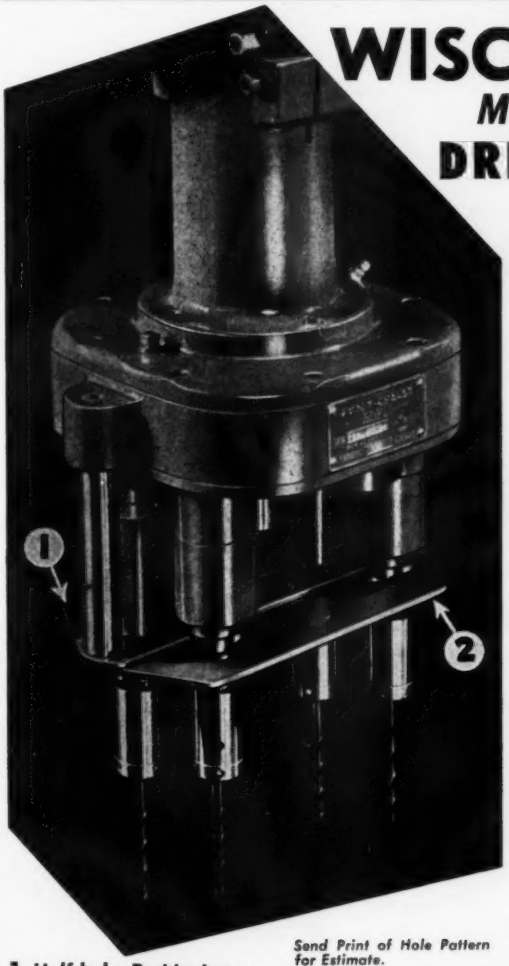
Precision stock miniature gears are covered in a whopping 256-pager from Perfect Gear & Instrument Co. Check Inform-A-Gram No. C58.

Wet blast units are the subject of a brochure from Pressure Blast Mfg. Co. Circle Inform-A-Gram No. C59.

A 60-page handbook of "Cold Drawn Buttweld Mechanical Steel Tubing" comes from Pittsburgh Tube Co. through Inform-A-Gram No. C60.

Product value analysis technique is explained in a new H. M. Harper Co. booklet entitled "Fastener Value Analysis." No. C61.

Metal Powder Industries Federation, 60 East 42nd St., New York 17, N.Y. offers two new issues of Powder Metallurgy Quarterly. Write to above address.



WISCONSIN
Multiple
DRILL HEADS

Adjustable and Fixed-Spindle Types

Adjustable Spindle Heads have Dual Positioning Plates for fast, accurate set-ups that "stay put".

Positioning and Locking Templates are furnished for each bolt circle or hole pattern . . . to your exact specifications.

Half-hole Positioning Plates (1) make it easy to swing spindles into place quickly. Locking Plates (2), with full holes, are mounted on support posts to lock set-ups securely against shifting.

6 Capacity Ranges . . . from "Light Duty" to "Extra Heavy Duty". Standard Models have 2 to 8 spindles. Special Models built to order.

Send Print of Hole Pattern for Estimate.

1. Half-hole Positioning Plate.

2. Locking Plate has full holes to hold spindles in place.

Wisconsin builds Standard Adjustable-Center Drill Heads, Special Fixed-Center Drill Heads, Lead Screw Tapping Units, Wis-Matic Universal Drill Tap Machines, Fixture Bases, and Special Drilling and Tapping Machines.

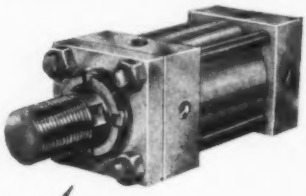
WISCONSIN DRILL HEAD CO.

4975 N. 124TH STREET • BUTLER, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 95

A-OK

AIR and HYDRAULIC
CYLINDERS
and
BOOSTERS



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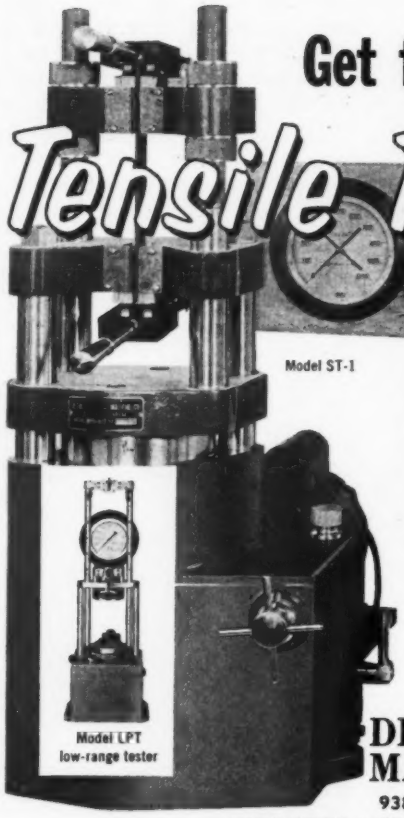
A-5520A

The SP Manufacturing Corp.
A BASSETT COMPANY
ESTABLISHED 1916
30201 Aurora Road • Cleveland 39, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 961

Get fast, accurate
Tensile Testing
hydraulically



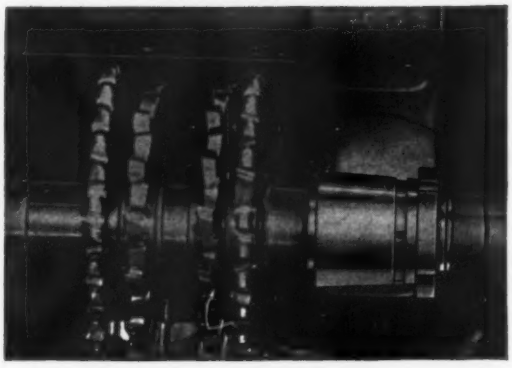
Hydraulically powered Detroit tensile testers put you in command of every phase of the test. Self-acting, open-sided specimen grips permit easy specimen insertion. Constantly controlled hydraulic rams apply up to 40,000 pounds, smoothly and quickly. Special load gauges, grips, or other modifications gladly supplied.

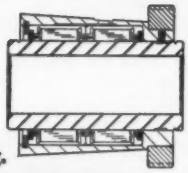
Write today for more information about our tensile testers

DETROIT TESTING MACHINE COMPANY
9386 Grinnell Avenue, Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 962

Replace the bronze bushing in your
MILLING MACHINE ARBOR SUPPORT
with a Sonnet ROLLER BEARING





Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

Write for catalog.

SONNET
TOOL & MFG. CO.
580 North Prairie Avenue
Hawthorne, California

CIRCLE INFORM-A-GRAM KEY NO. 963

Catalogs . . .

The new Rivett 1020 Manufacturing lathe, with variable power feeds and power tracer equipment, is highlighted in Bulletin 1020 CL from Rivett Lathe & Grinder, Inc. Inform-A-Gram No. C62.

Model A Hi-Jack load lifter stacks bulky loads ceiling or roof-high in minutes, and is the subject of a catalog sheet from Vermette Machine Co., Inc. Inform-A-Gram No. C63.

Circling Inform-A-Gram No. C-64 will bring you a 20-page bulletin covering the construction, operations and optional equipment for the new Brown & Sharpe Rangemaster sliding-head type, milling machines.

Checking Inform-A-Gram No. C65 will bring you a catalog on the entire line of transistorized, precision, low-cost gaging instruments from Techni-Rite Electronics, Inc.

Bulletin MM57 from Brown & Sharpe Mfg. Co. gives specifications and illustrations of four new Dynamaster 2 vertical milling machines. Check Inform-A-Gram No. C66.

Portable and adjustable conveyors, hinged-steel belt conveyors, and custom conveyors are described in Catalog MF-100 from MayFran Mfg. Co. Inform-A-Gram No. C67.

Conversion and operational advantages of a new hydraulic tracer conversion unit are detailed in Leaflet DHT-161 from Detroit Broach & Machine Co. Inform-A-Gram No. C68.

EM-200 electron microscope, its resolving power, magnification range, accelerating voltage, micrographic facilities, focusing astigmatism compensation and other data, are discussed in a folder from Philips Electronic Instruments. Inform-A-Gram No. C69.

Hamilton Goes to Florida

The Hamilton Tool Co., Ninth at Hanover St., Hamilton, Ohio, manufacturers of super sensitive small hole precision drilling, tapping, gear hobbing machines, and Portelvator, portable elevating tables is now represented in St. Petersburg, Florida.

AUTOMATIC BRUSHING SETUP buffs mirror finish on 12" wrench parts for plating. Multiple parts are mounted in special removable fixture. Machine automatically positions and oscillates parts between brushing heads for 25 strokes per cycle. Each head is made up of 65 Osborn Bufcut® treated cord brushes.

MIRROR FINISHING wrenches nine at a time with OSBORN power brushing

This leading tool manufacturer uses Osborn power brushing to buff a mirror finish on forged steel wrenches, pliers and chisels before plating.

Pre-mounted in multiples on removable fixtures, the tool parts are buffed in a special machine which automatically lowers and oscillates the parts between two Osborn Bufcut® brushing heads. The operation is simple, fast, inexpensive. This method has been in continuous use in this plant for nearly 12 years—*still proves to be the best way to do the job today.*

It's a typical example of how Osborn power brushes and brushing methods—through years of exceptional, dependable service—are handling industry's tough metal finishing jobs. If you have a metal finishing problem—deburring, cleaning, polishing, precision blending—an **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, can pinpoint the answer. *Write or call The Osborn Manufacturing Company, Dept. L-9, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

OSBORN

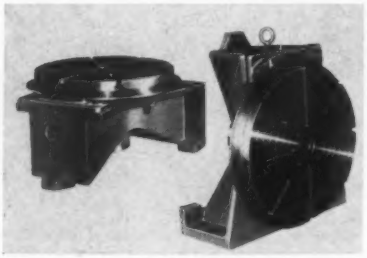
Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

CIRCLE INFORM-A-GRAM KEY NO. 97

T&P Product News

Rotary Angle

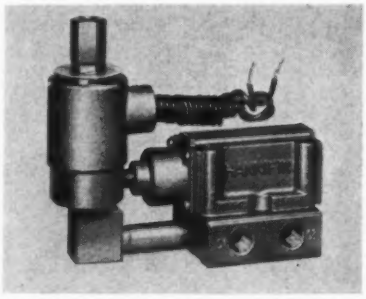
A new combination rotary table and angle plate can be used either horizontally or vertically for a number of inspection, layout and machining applications. The unit's free-wheeling face plate rotates 360° with a radial accuracy by vernier to 5 min visual reading.



For convenient readings, either horizontal or vertical, graduations are on a 45° angle. Overall table diameter is 18″. Table flatness and runout to 0.0002. From Machine Products Corp., 6771 E. McNichols Rd., Detroit 12, Mich. Inform-A-Gram No. P1.

Explosion Proof

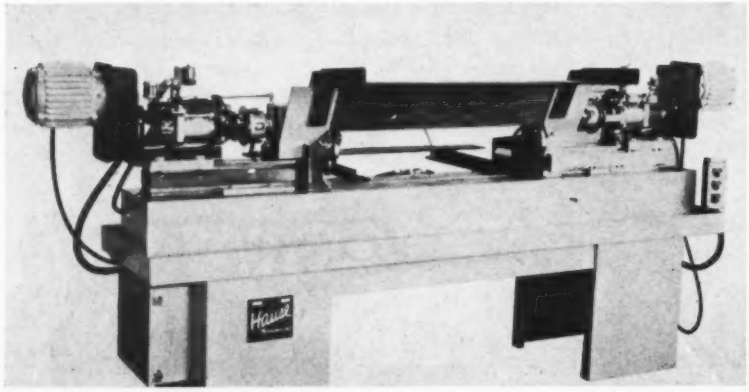
Now there are explosion proof solenoid actuators for both momentary and maintained contact CC pilot operated air valves. The ac-



tuators are suitable for class 1, group D and class 2, groups F and G hazardous applications. Hannifin explosion proof valves are compact, leakproof with large air flow capacity. Optional bottom ported bases, bottom and side ported bases and integral speed control sections are available. Hannifin Co., Dept. 164, 501 S. Wolf Rd., Des Plaines, Ill. Inform-A-Gram No. P2.

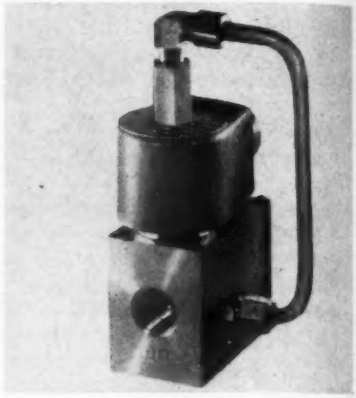
Double End Threads

A new thread rolling machine automatically rolls 6000 threads/hr. At 3000 parts/hr the Size A Holomatic works on both ends of steel, aluminum and brass rods. Thread sizes from 6-40 to ⅞-9 up to 4″ long can be rolled on rods from 5 to 76″ long. The air-powered, hydraulically-fed units have electric motor driven spindles. They're used to power self-opening, end-feed-type, thread rolling heads. The machine operates single cycle or fully automatic. An operator is needed only to place rods in the magazine storage. The machine automatically escapes, locates, clamps, thread rolls, unclamps and ejects parts in proper sequence. A change of tooling makes the machine drill, center, chamfer and face. Write Hause Machines, Inc., Montpelier, Ohio, or Inform-A-Gram No. P3.



Solenoid Valve

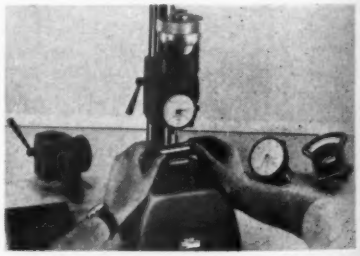
A new 2-way high pressure solenoid valve is especially suited for hydraulic applications. The valve is open when solenoid is de-energized. It operates at up to 1000 psi air pressure, 850 psi water and light oil pressure. The unit comes in ½″ N.P.T. pipe size, with brass



body and integral seat, and composition disc. This valve is available with either general purpose, watertight or explosion-proof solenoid enclosures. It may be mounted in any position without affecting operation. Write Automatic Switch Co., Florham Park, N.J., or circle No. P4.

Your Choice of Comparators

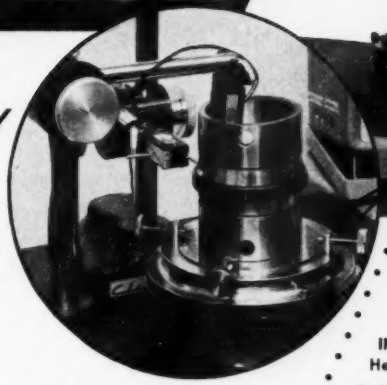
The basic unit of a new comparator is a base and precision column on which one's choice of dial indicator gaging units can be assembled. For increased adaptability the comparator is offered with a variety of interchangeable reference surfaces. One combination features a Micrometer head with a



0.0001 dial indicator. The 1″ range of the micrometer allows settings up to 8″ with the use of three gage blocks (1, 2 & 4″). The alternative holding arm can be used for other dial gaging arrangements, as well as the air, electric and electronic heads. Federal Products Corp., Providence 1, R.I., or No. P5.

The *Cleveland*
INSPECT-RON

for ROUNDNESS and CONCENTRICITY MEASUREMENT



The new Cleveland INSPECT-RON is especially adapted to inspection for roundness, concentricity and squareness measurement in the shop.

Measurement is made to a precise spindle mounted in the surface plate on top of the desk size console. Spindle accuracy is guaranteed radially and axially to .000005". The built-in polar coordinate recorder enables the operator to analyze the part measurements on a permanent visual chart.

Electronic gaging is provided by the use of the accepted Cleveland Indi-Ac which can easily be used for other gaging operations.

Cleveland Precision Instruments Include:

- **INDI-AC**—Ultra-Precision Electronic Height Gage
- **MICRO-AC**—Electronic Micro-Comparator
- **PAR-AC**—Electronic Production Gage
- **INDI-RON**—Ultra-Precision Roundness, Squareness and Concentricity Gage
- **INDI-AC Jr.**—General purpose precision gage. Battery and AC operated.

Cleveland INSTRUMENT COMPANY
A SUBSIDIARY OF THE BENDIX CORPORATION

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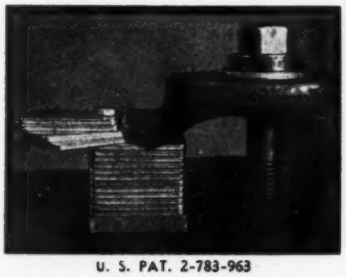
CIRCLE INFORM-A-GRAM KEY NO. 991

NEW!

HANDY ADJUSTABLE

RISER BLOCKS



U. S. PAT. 2-783-963

***for* FASTER—SAFER—CHEAPER SETUPS**

Use on Drill Presses—Milling Machines—Punch Presses—Surface Grinders—Planers, etc. End lost time looking for right height odds and ends.

HANDY RISER BLOCKS

- Give heights from ⅜" to 2⅜" in ⅛" increments.
- Cut setup time by eliminating haphazard blocking.
- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

ORDER TODAY. USE THIS COUPON.

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Gentlemen: Please ship ..... pairs of RISER BLOCKS.
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By ..... Title .....
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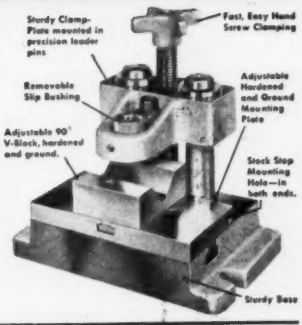
Open account shipments to rated companies. Otherwise, payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax.

REPCO *Time-Saving Tools*

ADJUSTABLE V-BLOCK
DRILL JIG
Saves Set-Up Time—Increases Output

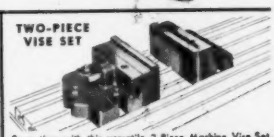

Sturdy Clamp-Plate mounted in precision loader pins
Fast, Easy Hand Screw Clamping
Removable Slip Bushing
Adjustable Hardened and Ground Mounting Plate
Adjustable 90° V-Block, hardened and ground.
Stock Stop Mounting Hole—in both ends.
Sturdy Base

Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity #80 to ⅞" diameter. Handles stock from ¼" to 2" diameter.

TRUE-CENTER ADJUSTABLE TOOL HOLDER

The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides fast adjustment of the main body to compensate for as much as ⅛" machine misalignment. Cuts down on tool wear, breakage, and strap.

TWO-PIECE VISE SET

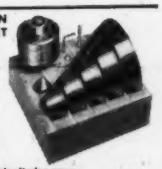


Save time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".

CHUCK JAW TRUING-RING SET

This Ring Set saves time, cuts cost of boring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by ⅛" increments. Handy peg-type rack keeps rings in place.

COMBINATION LIVE-CENTER SET



Heavy-duty live center plus six interchangeable adapters, ranging from a point to 6¼" dia. ball. Saves costly set-up and machining time necessary to make large-diameter centers. Straight and various taper shanks available.

Write for complete information—Exclusive agent territories open.

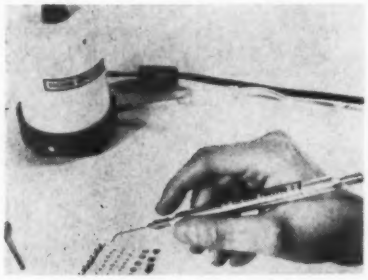
REPCO ROCKFORD ENGINEERED PRODUCTS CO.
2322—23rd Avenue • Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 992

Product News

Handles Miniature Parts

V-100 vacuum tweezer, a self-contained miniature parts system, utilizes vacuum energy to handle tiny objects, delicate parts, or miniature components. Covering the by-pass opening in the pencil shaped body with the index finger gives the operator vacuum control.



Write Anco Products, 276 Park Ave., Collingswood 7, N.J., or mark Inform-A-Gram No. P6.

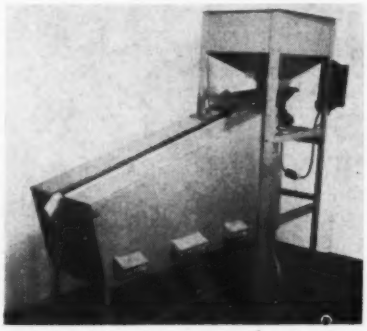
Component Selection

New ram type or platen guided industrial utility presses are offered on a component selection concept. This allows for broad choice of standard frames, working forces, speeds, circuits, controls and power sources. Presses can be designed for specialized production jobs by simply selecting the proper combination of standard components to meet the pre-set require-

ments. The lowest capacity power source, a 25 ton model, will operate at 70 ipm advance, 31 ipm feed, 55 ipm return. With the largest power source speeds increase to 1080 ipm advance, 125 ipm feed, 865 ipm return. More from Hannifin Co., 501 S. Wolf Rd., Des Plaines, Ill., or Inform-A-Gram No. P7.

Precision Sorter

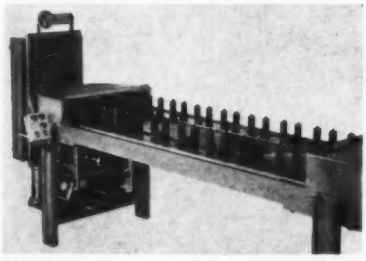
A new high speed precision gaging machine segregates items according to size and shape. A few



screw adjustments permit changes from one item or size to another. The unit sorts and gages steel balls, cylindrical parts, screws, nuts, bolts, beads, small die parts, buttons, rivets etc. Washers, nuts and disc shaped objects can be sorted for thickness while screws, rivets and other headed items are checked for head diameter. Gaging speeds are up to 2000 parts/min. Errors are plus or minus 0.0003. A vibratory feeder dumps parts on the sorting rollers. More from Count-O-Matic, Inc., 40-24 Twenty-Second St., Long Island City 1, N.Y., or Inform-A-Gram No. P8.

Carrousel

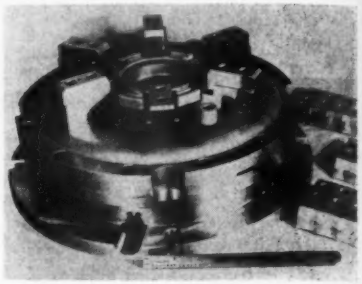
A new transfer machine chassis assembles and tests components up to 2000 pieces/hr. Precision indexing is obtained from a new cam-and-roller index drive plus a special close tolerance chain and platen linkage. Individual fixtures can be accurately located on any of the 26 platens within plus or minus



0.010 — with anvil type, positive support in all directions for pressing, staking, etc. The Carrousel Conveymatic is available in 10 to 50 ft lengths. Index drives offered are: mechanical cam-and-roller, hydraulic servo, and electro-mechanical. More from Visi-Trol Engineering, 12720 Burt Rd., Detroit 23, Mich., or No. P9.

Accurate Chuck

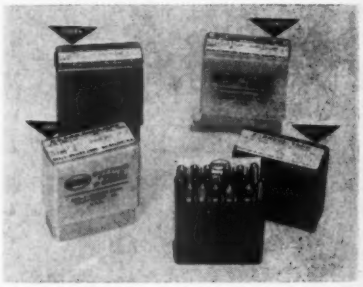
A new air-operated diaphragm chuck has extra-short overhang and special hardened and ground master jaws. The workpiece is chucked and released by compressed air operating on a piston that flexes the diaphragm thus opening the jaws the necessary few thousandths of an inch. When pressure is removed, the diaphragm flattens, closing the jaws and gripping the work. For additional grip,



chucks can be constructed with a double-acting piston. The new chuck employs one of the two available styles of special master jaws. Such jaw sets for different jobs are interchangeable and may be changed without loss of accuracy. Write Erickson Tool Co., 34350 Solon Rd., Solon, Ohio, or check Inform-A-Gram No. P10.

Color-Keyed Taps

By looking at the color you can tell what's inside. New Besly-Welles Corp. taps are now packed



in colorful containers. Colors used correspond with those of the tap selector chart. Straight fluted taps are now dressed in orange. Green packaging denotes spiral pointed taps, blue is for Besly X-Press taps, and red is used for special taps. Color-Keyed tap selection simplifies the specification of the proper tap in 75% of all tapping applications. The user need only know material to be tapped and four colors. More from Besly-Welles, South Beloit, Ill. No. P11.

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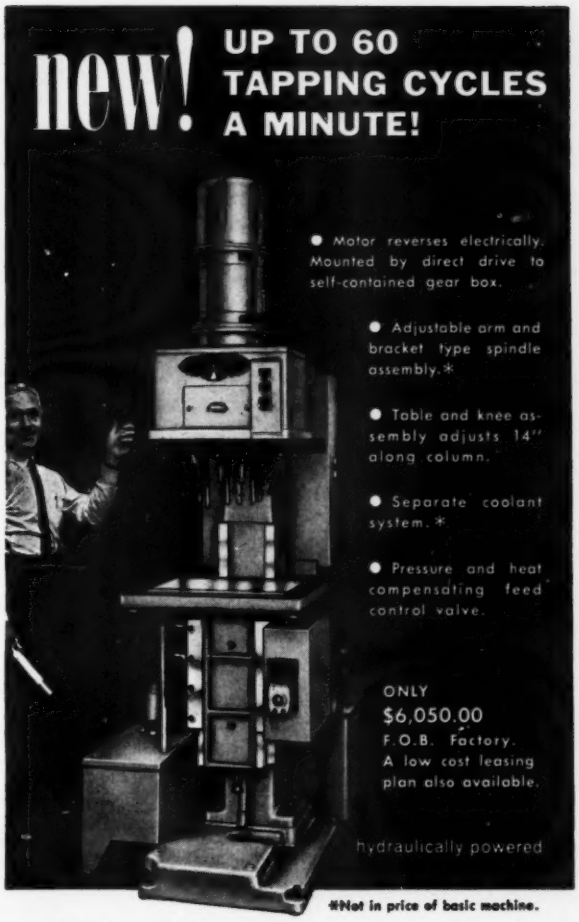
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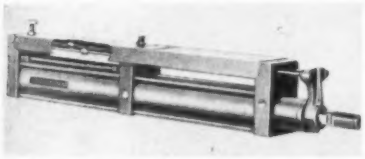
CIRCLE INFORM-A-GRAM KEY NO. 1012

Product News

Actuate and Automate

A new air-hydraulic actuator automates milling machines, lathes, drill presses, and assembly lines. It provides smooth work or tool feeding, increased production and longer tool life. Two movable cams provide fast, slow and skip feed strokes. A built-in bypass valve with travelling rods allows rapid advance to any point in the stroke,



pick-up to rapid feed and return to controlled rate. This cycle can be repeated several times during the stroke by merely setting the bypass valve cams. Made by Electro-Mechano Co., 261 E. Erie St., Milwaukee 2, Wis., the unit comes in 2 and 3″ bores and stroke lengths of 2, 4, 6 and 8″. Write, or check Inform-A-Gram No. P12.

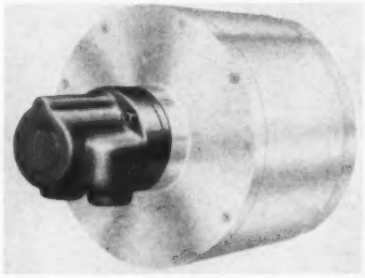
Checking Inside

Model A-294 B-29 gage works pneumatically. It quickly checks both round and rectangular plates, in dimensions as small as ⅛″ and below. Contact pressure is adjustable. It allows selection of pressures heavy enough for positive readings, yet light enough to not

distort delicate walls of vacuum plates. Several magnifications and ranges are available with graduations in size differences as small as 0.000050. Magnification can be varied by merely interchanging plunger units and meter dials. More from Federal Products Corp., Providence 1, R.I., or No. P13.

Air Inlet

A new compact RM4 air inlet allows higher spindle speeds up to 4000 rpm on S-P Mfg. Corp.'s line of rotating air cylinders. The inlet



requires less maintenance and has special inlet seal that adjusts itself automatically through working pressure. The new RM4 is available on rotating air cylinders in bore sizes of 3, 4½, 6, and 8″ from S-P at 30201 Aurora Rd., Cleveland 39, Ohio. Inform-A-Gram No. P14.

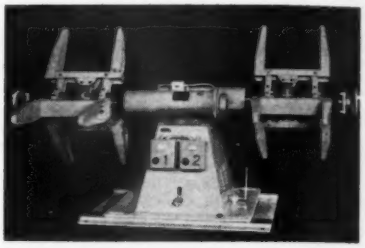
True Readouts

No matter how hard you push the switch (or who pushes) you're bound to get the same readings

with a new Model HDR Carson-Dice electronic micrometer. Even unskilled operators can make precision, accurate measurements, since operator discrimination is eliminated. Measurements are displayed on a four digit counter reading to 20 millionths. No gage blocks are necessary. Model HDR, with its built-in skills, is not a comparator but is a true screw thread measuring instrument. It has a convenient external zero reset for the counter that may be zeroed in at any point within instrument capacity, permitting rapid shifting of fixtures and setups. Write J. W. Dice Co., Englewood, N.J., or check No. P15.

High Production Stamping

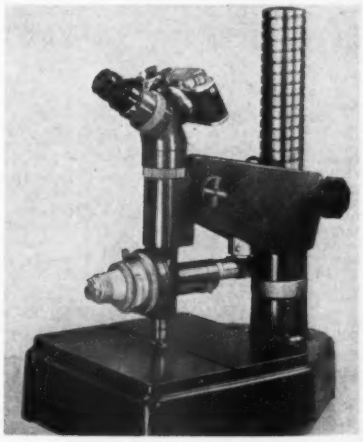
A new double coil stock reel uncoils smoothly to stamping presses and other allied automatic production equipment. The double reel feature allows loading the off side while the other side is operating. Both reels have individual electric brake and rheostat controls to prevent stock over-run and to keep the proper tension on the stock.



Each reel takes stock up to 24″ wide and up to 2500 lbs. Maximum coil OD is 40″; ID is adjustable in various models from 12 to 23″. More from Cooper Weymouth, Inc., 600 Honeyspot Rd., Stratford, Conn., or on Inform-A-Gram No. P16.

Measure without Touch

A new measuring device determines the smoothness of surface finish interferometrically, without touching the actual surface. This is particularly valuable in case of critical and delicate surfaces. The new interference microscope is the Leitz light wave tester from Opto-Metric Tools, Inc., 137 Varick St., New York 13, N.Y. The instrument



employs the Michelson beam splitter method and measures in light waves. A choice of three interchangeable magnifications of 100, 200 and 500X is standard equipment. Write for Catalog 86-6, or Inform-A-Gram No. P17.

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Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

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Pin dia. ⅞", 1" or 1⅛"	Pr.	$ 6.50
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MEYERS works to tolerances of .0001"; makes tipped cutters as thin as .030", solid carbide cutters much thinner; diameters of ¼" and up.

The finest quality and proper grade of tungsten carbide is engineered to the cutter's job. Tools are precision ground and lapped for long life, tipped to carefully tempered and ground bodies.

• It costs no more to enjoy the production advantages of MEYCO tools: "precision" minded since 1888, careful workmanship, well equipped shops and capable design engineers . . . all add up to plus values for you.

SPECIALISTS—Your special problems in the field of cutting, slitting, slotting, under-cutting or form-cutting are solicited.

Write for New Cutter Catalog No. 51

MEYCO W. F. MEYERS CO., Inc.
BEDFORD, INDIANA
A famous name in precision tools since 1888

CIRCLE INFORM-A-GRAM KEY NO. 1032

IF you are gaging precision holes note the advantages of the

E-X-P-A-N-D-I-N-G PLUG GAGE

1 **2-POINT CONTACT,** automatically and positively assured. This means you can read the exact diameter at any point, detecting front or back taper, ovality, bell mouth, etc.

2 **AUTOMATIC POSITIONING.** The alignment and centering are automatic, and the gaging pressure is automatically uniform. This means that you can put Comtorplug into the hands of any operator, with a few minutes' instruction, and get accurate gaging as well as repeatable duplication person-to-person.

3 **PRECISION ASSURED.** The dial reading is fixed — not passing — easily readable within .0001". (See actual size illustration at right.) This means your operator reads the exact size, no "guesstimating." Comtorplug gives exactly what is needed for Statistical Quality Control programs.

No other Gage like it!

These basic advantages tell you why Comtorplug stands out as a gage of ASSURED PRECISION and EASE OF APPLICATION. Used by the thousands on automotive transmission, electrical equipment, high speed machinery, anti-friction bearing housings, household equipment and similar volume-precision operations. Let us send you the facts.

REQUEST BULLETIN 51

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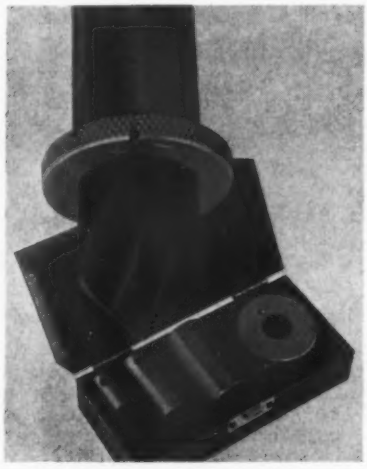
E-X-P-A-N-D-I-N-G PLUG GAGE
FOR HOLES ⅛" TO 10" DIAMETER

CIRCLE INFORM-A-GRAM KEY NO. 1033

Product News

Resharpener

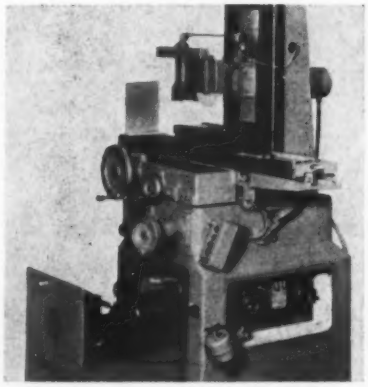
Unicam is a unique resharpening fixture that adapts easily to any tool room grinding equipment. It's ideal for resharpening the Ford Uniflute countersink to original factory specifications. A packaged



assembly is available and this includes box, cam body, locating ring, adapter sleeves and key. Write M. A. Ford Mfg. Co., Inc., 1545 Rockingham Rd., Davenport, Iowa, and ask for Bulletin 108, or circle Inform-A-Gram No. P18.

Pack in the Drawer

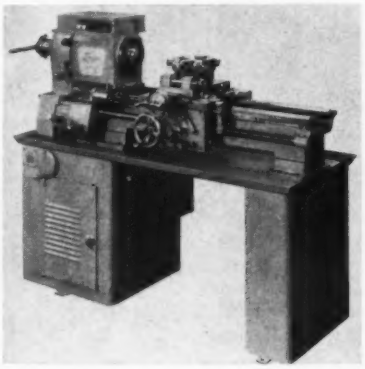
Model 618-HYD all-hydraulic surface grinder features a low pressure hydraulic power pac with electric valve controls and double pump. The entire hydraulic unit is housed in a handy pullout drawer.



A double pump provides separate hydraulic circuits for table and cross slide motions. A flick of the lever allows switch from power to hand feed, without stopping the grinder. More from Reid Brothers Co., Inc., Beverly, Mass. No. P19.

Chucking

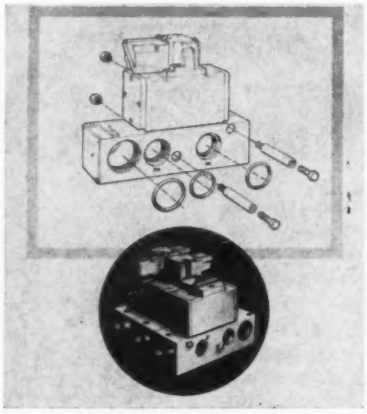
To make it more accurate and rigid, the turret of a new eight station turret chucking machine is



mounted on a pre-loaded sealed ball bearing. Other features are super precision headstock, spindle, flame hardened bed, and ball bearing variable speed drive. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill. Inform-A-Gram No. P20.

Add-A-Fold

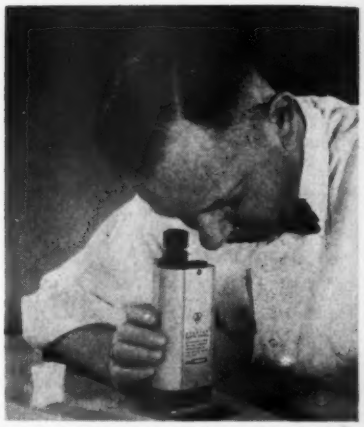
With Add-A-Fold bases, HH air valves may be bolted together in any combination of actuations and



mounted on 3⅛" centers. Air supply, exhaust and electrical passages are tapped from both sides of each base to permit the common connections to be attached at either side of the group. Grooves for O-ring gasketing are provided to assure leak-proof connections between bases. The electrical junction box is built into the Add-A-Fold base leaving the valve undisturbed after installation. Cylinder ports are in the end opposite the electrical junction box. Write Hannifin C., Dept. 164, 501 S. Wolf Rd., Des Plaines, Ill., or No. P21.

It's a Scratch Scanner

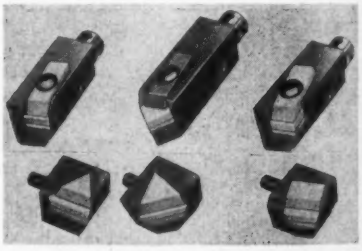
A new scratch depth gage measures scratches, grooves, and other indentations on flat or curved surfaces. The unit works equally well for measuring raised portions of workpieces. It should be of value for measuring wing skins or aircraft, and high pressure pipe and tubing where excessive scratches could result in structural failure.



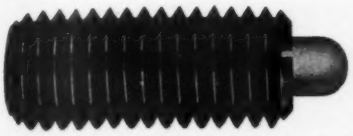
Added applications include quality control in the metals industry. The gage gives accurate measures of plus or minus one tenth, or 5% of depth. The same measuring range applies to raised portions. Write Bausch & Lomb Inc., Rochester 2, N.Y. and request Bulletin D-2012. Or circle Inform-A-Gram No. P22.

Tailored Tooling

Kendex Tailored Tooling by Kennametal, Inc., Latrobe, Pa. brings the building block approach to boring, chamfering, and facing operations. The adjustable units use standard Kendex throwaway inserts. The two-way adjustments of



bore diameter and shoulder length provide for precision tolerances. These tolerances can be maintained by a micro-adjustable screw, when compensation for insert wear is required. Tools are available in a wide range of rake and lead angles. Write, or circle Inform-A-Gram No. P23.



SPRING PLUNGERS are now available in four types and thirty-four sizes. Black Pentrate Nose with standard spring pressures, 6-32 thru 1"-8 threads. Cadmium Plate Nose with light spring pressures, 6-32 thru 1"-8 threads. Black Nylon Nose with standard spring pressures, 8-32 thru 5/8"-11 threads. White Nylon Nose with light spring pressures, 8-32 thru 5/8"-11 threads. Northwestern Tools, Inc., 122 Hollier Ave., Dayton 3, Ohio.

PLASTIC BALL KNOBS with brass inserts are now available in four diameters and twelve thread sizes. 3/4" diameter with 10-32 threads. 1" diameter with 1/4-20, 1/4-28, 5/16-18 or 5/16-24 threads. 1 3/8" diameter with 3/8-16, 3/8-24, 1/2-13 or 1/2-20 threads. 1 7/8" diameter with 1/2-13, 1/2-20 or 5/8-18 threads. Northwestern Tools, Inc. 122 Hollier Ave., Dayton 3, Ohio.

SWING "C" WASHERS complete with shoulder screws, are now available in four sizes for 3/8", 1/2", 5/8" or 3/4" bolt sizes.

Write or call today for your free new 16-page cataolg. Catalog includes tracing templates of jig and fixture components. Northwestern Tools, Inc. 122 Hollier Ave., Dayton 3, Ohio.

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QUICK CHANGING PUNCH AND CARBIDE DIE AT NO EXTRA COST

CUTS 1/4" STEEL • 3/8" ALUMINUM

The MODERN GOBBLER cuts 1/4" mild steel, 3/8" aluminum & 7/32" stainless steel. No distortion, bending or curling. Ideal for shipyards, welding shops, kitchen equipment builders, heavy duty metal fabricating shops.

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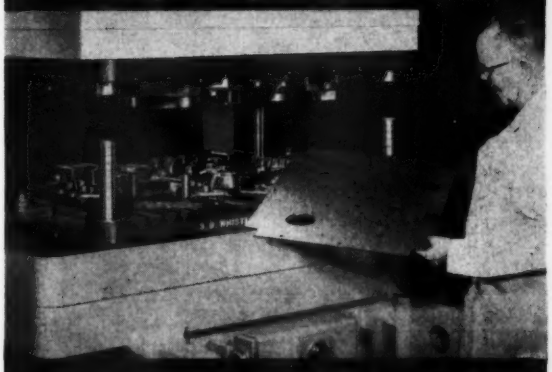
For Perforating and Notching Materials up thru 1/4" Mild Steel



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CIRCLE INFORM-A-GRAM KEY NO. 1054

LIFTING DEVICES

for
FAST • SAFE • BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS

H. L. BUSHMAN CO.
100-A W. Central Ave.
Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1061

Magnetic Base Tool Holder

21 MAGNETIC TOOLS

11 Permanent Magnets—Various Sizes and Types

Indicator Holder — ½" dia. non-magnetic stainless steel rod complete with 3/16" and ⅝" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

Model 200B—$6.95

Write for Catalog No. 958-C

CULLEN MFG. CO., INC.
1603 Washington Ave. Racine, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1062

HARDNESS TESTING
has been done with the **SCLEROSCOPE**
Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

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DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1064

KELLER Die Filers

Deluxe $159.00

3 MODELS

ECONOMY—4 Way tilting table, with motor, $119.00
STANDARD—Has file roller support, with motor, $139.00
DELUXE—Has reciprocating vertical slide, with motor, $159.00

Sales Service Mfg. Co.
2361-146 University Avenue
St. Paul 14C, Minnesota

Ask your Industrial Distributor or write TODAY for BULLETIN 660

CIRCLE INFORM-A-GRAM KEY NO. 1065

Product News

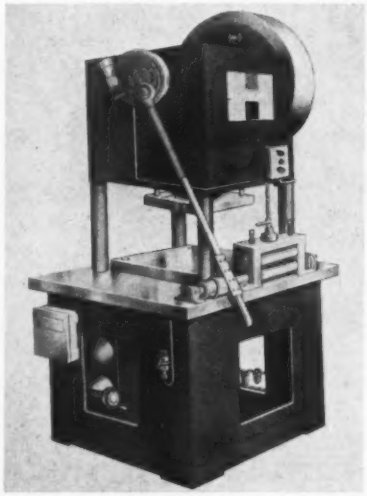
Turret Head

A Mag turret head with eight station air-lock turret converts any make or size standard engine lathe

into a versatile chucking machine. The unit cuts machining time, simplifies difficult jobs, and speeds tooling. It provides rigid tool mounting and repeat indexing within 50 millionths. Write Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill. No. P24.

Longrun Stamping

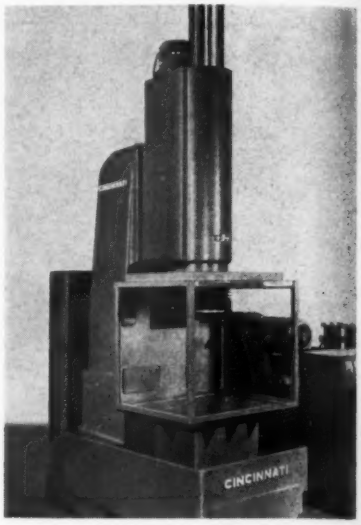
Model 25B, 25 ton straight-side, cylindrical ram press, is designed for fast, high production run blanking, punching, shearing, forming and piercing. It will handle small to medium-weight jobs and is especially good for bulky jobs requiring large die areas. Actual dimensions are 20 X 12⅞". The press is available in expanded bed model with extra wide Auto Feeds.



The cylindrical ram, straight-side construction, and automatic shut-off all lend longer die life. The unit's air clutch assures positive engagement with flywheel through 360° friction surface for increased operating torque. Havir Mfg. Co., 444 N. Cleveland Ave., St. Paul, Minn. will offer particulars, or circle Inform-A-Gram No. P25.

Electrochemical Machining

New electrochemical equipment removes hard-to-machine metal at production rates. Rapid chemical reaction is caused by an electric current through the electrolyte. The tool imparts its shape to metal being machined, and the surface comes up free of burrs and stresses.



Cincinnati Milling Machine Co., Cincinnati 9, Ohio offers ECM's in two sizes. The #0 machine has 8" quill traverse and the #1 machine has 22". The 1 ECM contains an anti-friction bearing for the quill, a plexiglass enclosed work area, and an electrolyte reservoir tank and pump unit. Write, or check Inform-A-Gram No. P26.

Getting Into Crevices

For deburring hidden recesses, inside surfaces and other problem configurations, new angle blades are the answer. The 45 or 90° model blades make vest pocket

scrapers from Titan Tool Supply Co. more versatile. Write Titan at Box L, Comet Ave., Buffalo 16, N.Y., or check No. P27.

A MAJOR BREAKTHROUGH ON ENGINEERING CAMS

by the world's leading **CAM** manufacturer

Write for Bulletin No. 105
which completely details and outlines
how you can

SAVE 2,300%

on engineering computation alone

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CIRCLE INFORM-A-GRAM KEY NO. 1071

GENESEE Carbide Tipped Inserted Blade Facing and Counterboring Tools

Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

Carbide Tipped H.S.S. Blades. Save 25% or more over cost of Solid Tools

• Consult our Engineering Dept. on your Inserted Blade Production Tool Problems.

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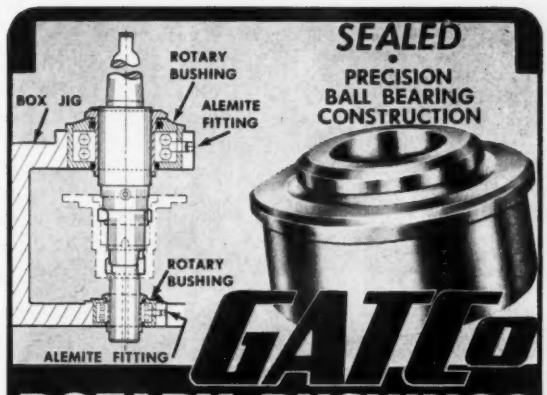
GENESEE MANUFACTURING COMPANY
566 HOLLENBECK STREET, ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Tube Deburring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1072



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PRECISION BALL BEARING CONSTRUCTION

GATCO

ROTARY BUSHINGS

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices.

GATCO ROTARY BUSHING CO.
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GLenview 3-2295

CIRCLE INFORM-A-GRAM KEY NO. 1073

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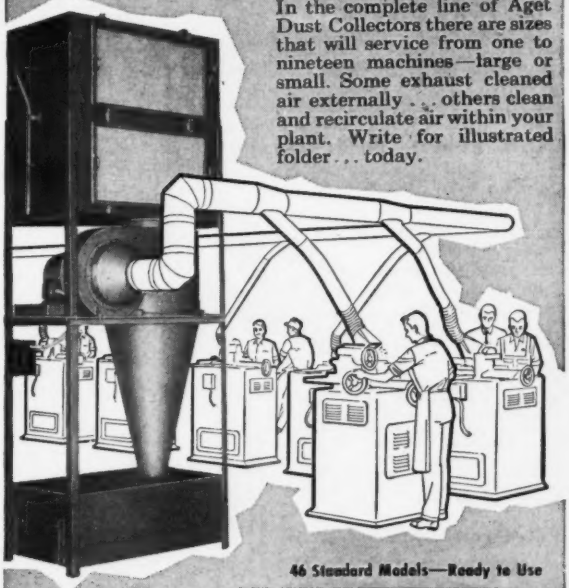
just ONE DUSTKOP STOPS DUST

heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.

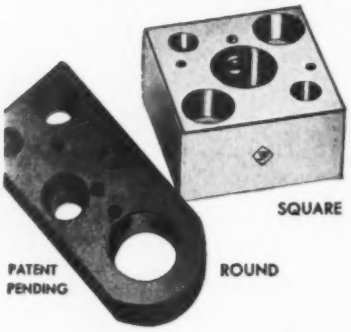


46 Standard Models—Ready to Use

AGET manufacturing company
1394 Church Street • Adrian, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1074

3P
Kwik-Pull
RETAINERS
for BAL-LOK PUNCHES
...DIE BUTTONS



The new, improved 3P KWIK-PULL Bal-Lok Retainer is designed for easy removal. Ordinary standard screws, serving as jack screws, quickly demount the new 3P Retainers from position on dowel pins. Saves time, eliminates possible damage to retainers and die. Write for 3P Catalogue No. 200.

Porter Precision Products
P. O. BOX 208, CINCINNATI 15, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1081

HIGH SPEED motor driven
WIRE STRIPPER

Exclusive "Triple-Disc" Cutting Mechanism centers cable for accuracy, gives more and better cutting edge.

Only $159.50* F.O.B.

Completely removes any type of insulation (including plastic) cleanly, without damage to solid stranded or multi-color cable to ½" diameter. Strips to 1½" length. Works instantly, simple to adjust. ¼ H.P., 110 volt single phase AC motor. Immediate delivery. Write or wire today.

*Subject to Change without notice.

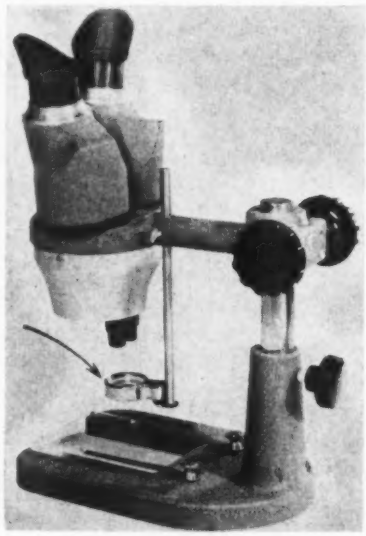
High Speed Hammer Co., Inc.
307 Norton St. Rochester 21, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1082

Product News

Stereo Microscope

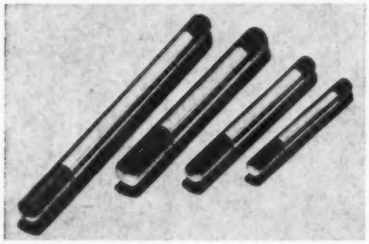
A new direct measurement microscope is recommended for production and research in the lab, shop or factory. It's useful for inspection, counting, checking, assembling and speedier quality control. Two direct measuring attachments are offered by Edmund Scientific Co., Barrington 58, N.J.,



a regular comparator reticle for on-the-spot checks of linear dimensions, diameters, radii, and angles, and a sand measuring reticle for measuring sand and other particles of matter. The instrument is equipped with two wide-field standard Kellner 10X eyepieces for choice of magnification. Write, or check No. P28.

Studs

Machine and fixture setups will be simplified with rugged alloy steel studs. The studs, with tensile strength of more than 125,000 psi, are available in stock diameters of



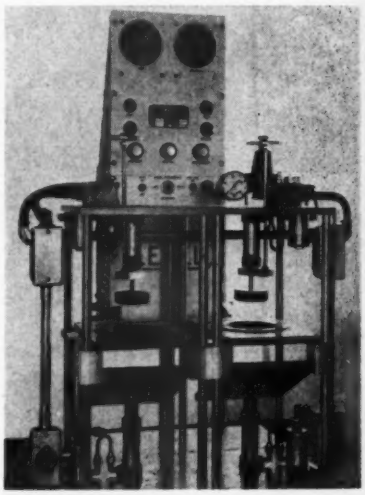
¼, 5/16, ⅜, ½, ⅝, ¾, ⅞ and 1". According to Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, Ohio, the studs will outlast others 5 to 1. Write, or circle No. P29.

Relief Valves

CR right angle check or relief valves allow flow in one direction and provide positive stoppage in the other. The valves feature an internal tamper-proof cracking pressure adjustment. A guided poppet incorporates a non-extrudable soft seal that cannot be washed out by the fluid stream. Built for operating pressures up to 5000 psi, the valves are available in ¼ to 1¼" sizes and with cracking pressures from 5 to 150 psi. They're usable with any fluid compatible with all-steel construction. The Manatrol Corp., 2372 W. 7th St., Cleveland 13, Ohio, or P30.

Two-Station Heating

A new two-station induction heating fixture is designed for brazing, shrink fitting, hardening and other heat treating operations. After loading is completed at one station, the operator activates the following automatic functions: transferring high frequency power to area that needs heat; timing the heating cycle; timing the holding



period for applied pressure or cooling; releasing the completed part. During automatic operation of one station, the other one is loaded and the controls are alerted. Heating of the newly loaded station begins as soon as the first station is completed. Lepel High Frequency Laboratories, Inc., Woodside, N.Y. claims that even an unskilled operator can produce at a high rate. Inform-A-Gram No. P31.

Severance
CARBIDE End Mills outlast dozens of High Speed End Mills on most jobs!
- BETTER PERFORMANCE
- MORE PRODUCTION
- WIDER APPLICATIONS
- MAXIMUM RIGIDITY

Your SPECIAL Carbide End Mill requirements are solicited.

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730 IOWA AVENUE
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CIRCLE INFORM-A-GRAM KEY NO. 1091

WLS
SHORT RUN STAMPINGS ARE YOUR ANSWER!

If time or money are important factors in that rush job, then WLS through skill and know-how in the specialized technique of SPEED-TOOLING, can produce your order to meet these exacting requirements and within as close tolerances as ordinary methods of stamping. Often we can meet or beat wild time promises of companies who are less well equipped in machinery and personnel.

Further — we can save you up to 85% of former costs!

COMPLETE FACILITIES
- Blanking
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- Countersinking
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- Machining
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FREE!
For those manufacturers who are faced with manufacturing problems, we offer a free bulletin illustrating many stampings we have produced, as well as a sample and cost summary of an actual part. We also offer free quotations from your blueprints at any time.

Will Lead to Savings!

WLS STAMPING COMPANY
Charter Member of Small Lot Stamping Institute
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Grinding Wheel ADAPTERS
TOOLROOM ACCESSORIES

FREE Catalog

- For Use on All Popular Surface Tool and Cutter Grinders
- Precision-made, Hardened & Ground with Heat Treated Nuts
- Complete Line—4 New Models of Adapters Available
- Large Stocks—Immediate Delivery

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140 E. 267th ST. • EUCLID 32, OHIO

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Prebco Bushing Company

MINIATURE DRILL BUSHINGS

.0002 tolerance on I.D., O.D. and concentricity	Hole sizes—from .005 O.D.s—from 1/16" Lengths—from 1/8"

COMPLETE STOCK MAINTAINED
SPECIAL MANUFACTURING TO SPECIFICATIONS

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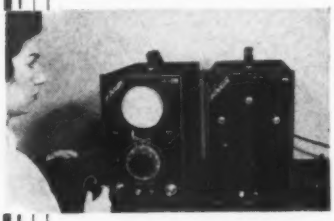
EDgewood 7-0112

PREBCO BUSHING CO.
14714 E. ARROW HIGHWAY
BALDWIN PARK, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1094

EDDY CURRENTS
UNSCRAMBLE
METAL MIXUPS

(detect certain defects, too!)



THE CYCLOGRAPH

Sorts automatically—and non-destructively—accidentally mixed or incorrectly processed metal parts by their metallurgical characteristics; Analysis, Structure, Heat treatment, Hardness, etc. Detects certain types of cracks and defects.

Leading industrials everywhere use the CYCLOGRAPH as a quality control inspection instrument or for salvage operations. Write for complete details.

J. W. DICE COMPANY
ENGLEWOOD 4, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1101

REPLACE
SOLID BUSHINGS
with
CIRCO-FLEX
ADJUSTABLE BEARINGS

JIGS
FIXTURES
MACHINES

CIRCO-FLEX "LIVE" BUSHINGS

- Increase Speeds, Feeds, 200%
- Reduce Tool Breakage
- Eliminate Bushing Wear
- Use Economical Carbide Cutters
- Provide Greater Precision
- Available for ½" to 6½" Shafts
- Will stand greater sidewall pressures

Get time, tool, and money-saving advantages by replacing solid bushings with Circo-Flex adjustable roller bearing units. Available for ½" to 6" shafts or with straight roller bearings where space is a factor in ⅛" to 2" shaft sizes. Write today for complete information and authentic case histories.

DONLEY PRODUCTS, INC.
Dept. TP-11 • 11106 Avon Ave. • Cleveland 5, O.
CIRCLE INFORM-A-GRAM KEY NO. 1102

Product News

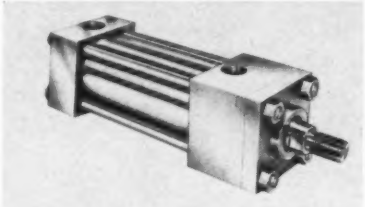
Doughnut Chuck

A new air chuck from Erickson Tool Co., 34350 Solon Road, Solon, Ohio has a doughnut piston design. This permits bar stock to pass completely through the chuck. The chuck accommodates a standard double-angle collet and provides 1/32" collapse accuracy in low tenths. The collet is mounted in

the front end of the chuck shank, which is mounted rigidly to the machine spindle. The '09 model air chuck is extremely quick-acting and delivers tremendous gripping power. Three sizes 7½, 8¾ and 10" dia are offered. Work size ranges from 2.125 down to 0.468 dia, or down to 0.093 with special collets. Write, or check Inform-A-Gram No. P32.

Square Head Cylinders

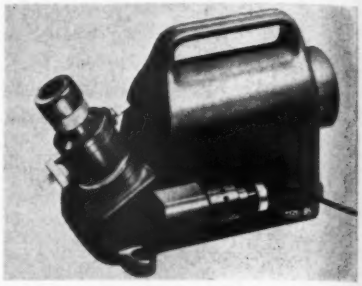
Series L square head general purpose hydraulic cylinders are rated up to 2000 psi. Bore sizes are 1½ to 14". The units are specifically designed for hydraulic service. They've vee-type rod packing, and a cylinder barrel of micro-honed



steel tubing. The cylinders are interchangeable with most cylinders of a similar type. Needle and check valves are also interchangeable, self-locking and flush set. Write Ortman-Miller Machine Co., 19 143rd St., Hammond, Ind. for Bulletin 116. Inform-A-Gram No. P33.

Biaxial Measuring

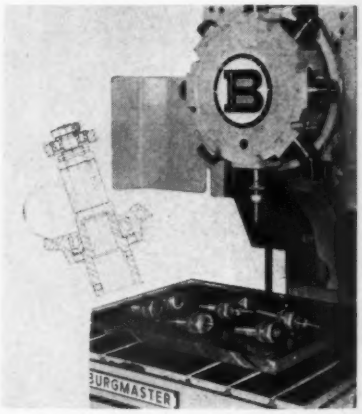
The Auto-Collimater measures in two axial planes. Biaxial measuring is simplified through diagonal direction of the minute



scale in the ocular. This new arrangement necessitates only one measuring motion which furnishes the readings in both coordinates, without rotating the ocular or the telescope tube respectively. The Leitz Auto-Collimater has cast iron housing, 20" folded beam, oversize aperture of lens and concealed hairline cross. Write Opt-Metric Tools, Inc., 139 Varick St., N.Y. 13, N.Y. No. P34.

Hollow Spindles

Turret drilling, tapping, boring, and milling machines from Burgmaster Corp., 15001 S. Figueroa St., Gardena, Calif. are now offered with hollow spindles as optional equipment. The hollow



spindles allow presetting to length on the bench while the machine is operating. When a tool becomes dull it can be quickly replaced, reducing machine downtime. The spindles also are credited with reduction of tool overhang and taking deeper cuts with fine finish and greater accuracy by eliminating long tool sleeves. Write the makers, or check No. P35.

New ARMSTRONG "90" SERIES RATCHET

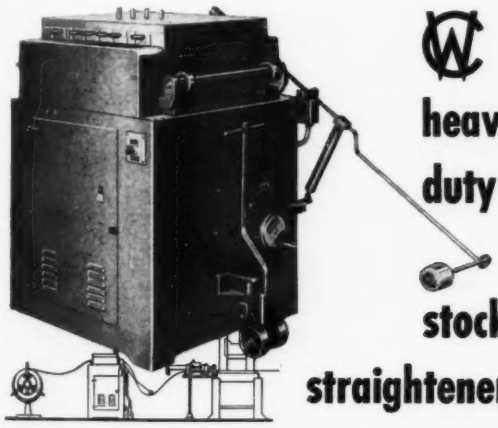
The ONLY Ratchet with ALL these important features!

1 Slenderized head
2 Thumb-operated reversing lever specially designed so it won't come off
3 Reversing-lever stop. Ball-and-spring prevents accidental shifting
4 Simple to clean—only tool required is a Phillips screwdriver. Wearable parts may be individually replaced
5 Thin handle with knurled grip
6 Hole in handle for convenient hanging
7 Fine-toothed gear
8 Easy ratcheting action
9 ¼", ⅜" and ½" square drives; two handle lengths on ½" drive

All wearable parts are replaceable; individually, inexpensively, easily. With no teeth cut into handle, it need never be replaced. *"ARMSTRONG" on these ratchets guarantees: advanced design, top quality and tool sense.

Extra heavy duty "50" Series ARMSTRONG ratchets (see right) in 1", ¾", ½" and ⅜" square drive sizes. Our General Catalog 700, gives complete information on these and approximately 5500 other ARMSTRONG tools. Your local ARMSTRONG Distributors will supply you a Catalog and demonstrate the new ratchets. If you don't know who he is, write us for his name.

ARMSTRONG BROS. TOOL CO.
5220 W. ARMSTRONG AVE. • CHICAGO 46, ILL.
CIRCLE INFORM-A-GRAM KEY NO. 1111



heavy duty stock straighteners

Copper Weymouth variable speed power driven stock straighteners can increase production and reduce costs by removing coil stock curvature before feeding to presses, shears and four-slide machines.

All heavy duty models are portable, cabinet type; most take stock up to 3/16" thick and are made in stock width sizes of 12, 18, 24 and 36 inches. Free loop arm can synchronize straightener speed to that of other equipment.

Ask about other Cooper Weymouth time saving production equipment, designed to increase output, decrease costs.

COOPER WEYMOUTH, INC.
603 Honeyspot Road, Stratford, Conn.
CIRCLE INFORM-A-GRAM KEY NO. 1112

FORD UNIQUE • UNICAM RESHARPENING FIXTURE

Resharpen the famous FORD UNIFLUTE COUNTERSINK in your own shop to original factory specifications

- Restores original factory cam-relief
- Reduces sharpening time and costs
- Easily adapted to your tool room equipment

Rotary FORD Tools

Packaged assembly, including cam body, locating ring, adapter sleeves and key. Set No. SUC-1, List Price, $30.00 TP-1161

M. A. FORD MFG. CO., INC.
1545 Rockingham Rd., Davenport, Iowa
Phone 324-3251 TWX DV-66

Manufacturers of Precision Cutting Tools
Dealerships Available

CIRCLE INFORM-A-GRAM KEY NO. 1113

Write Now for This FREE CATALOG #208

on Work Holding Tools For Production, Tooling, Maintenance

Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises and adjustable angle plates are illustrated and fully described in this new PALMGREN Catalog #208. It shows the *ONLY* complete line of work holding devices available anywhere. Designed for production, tooling and maintenance work, it shows over 70 different models and types, with jaw sizes from 1½" to 8". Ask for your FREE copy of this catalog today, it shows the complete line and prices.

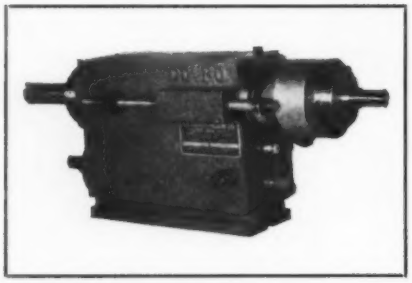
No. 2B Heavy duty 4" Angle Vise

No. 84, 8" Rotary Table

137

PALMGREN PRODUCTS
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILLINOIS
CIRCLE INFORM-A-GRAM KEY NO. 1114

A NEW "GOVRO"



MODEL 300
AIR HYDRAULIC
DRILLING UNIT
Stroke up to 3 inches
Capacity up to 1/2" in
Cast Iron
Spindle Speed—
Variable Belt Drive

Model 300 Basic Unit with Hydraulic System . . . Price $295.00

NEW—Integral Hydraulic System. No separate sump and valving as the volume of the Hydraulic System automatically varies with the volume of oil in the unit.

NEW—For forgetful Maintenance Men—Unit may be arranged to automatically stop when additional oil is required in the Hydraulic System.

NEW—Arranged to use standard foot mounted motors.

CUT COSTS BY DRILLING SEVERAL HOLES AT THE SAME TIME

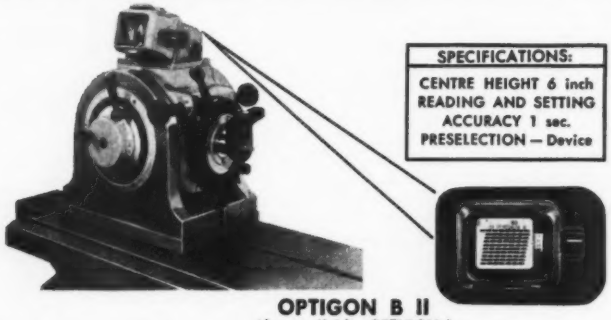
Write for Literature . . .

THE GOVRO-NELSON COMPANY
Machinists of Precision Parts Since 1923
1935 ANTOINETTE
DETROIT 8, MICHIGAN

Automatic DRILLING UNIT

CIRCLE INFORM-A-GRAM KEY NO. 1121

OPTIGON B II — OPTICAL DIVIDING HEAD A MASTERPIECE IN ITS CLASS



SPECIFICATIONS:
CENTRE HEIGHT 6 inch
READING AND SETTING ACCURACY 1 sec.
PRESELECTION — Device

OPTIGON B II
Also available: OPTIGON I

Truly another GENUINE
GUARANTEED . . . IMTCO QUALITY PRODUCT

IF NOT AVAILABLE AS YET AT YOUR FAVORITE MACHINERY DEALER, WRITE NOW! for more information.

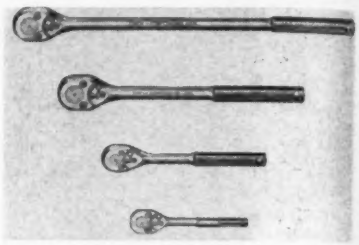
INTERNATIONAL MACHINE & TOOL CORP.
WARWICK INDUSTRIAL PARK • PROVIDENCE 5, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1122

Product News

Ratchet Wrench

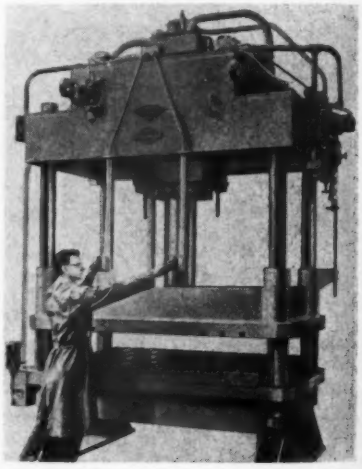
Series 90 reversible ratchet wrench has joined the Armstrong Bros. Tool Co. line. The unit comes in ¼, ⅜, and ½" square drives with two handle lengths in the ½" drive.



Features include a narrow head, round handle, thumb-operated reversing lever, fine-toothed gear. All combine for easy ratchet action and simplified cleaning. Write Armstrong at 5200 W. Armstrong Ave., Chicago 46, Ill. Inform-A-Gram No. P36.

Trim Press

The limitations of mechanically operated presses are overcome hydraulically by a new 4-bar trim press. The unit has an adjustable deceleration valve and exerts 100 tons of trimming stroke pressure. Fast approach velocity of 900 ipm



and a return speed of 875 ipm are for production. The slow trimming action of 59 ipm produces neatly sheared, clean castings. Other features are a 36 x 72" dia area, a supporting 52 x 88" base platen, safety stops on the tie bars, and a 30" stroke. From Greenlee Bros. & Co., Rockford, Ill. Inform-A-Gram No. P37.

NEW PRINCIPLE IN TORQUE CONTROL LOWERS ASSEMBLY COSTS

Rotor announces J-42T torque control air impact wrench with new hydraulic amplifier

● **NEW** unique hydraulic amplifier shuts off tool at desired torque. This exclusive device results in... ● **FASTER** rundown and impacting speed. Cuts job time. ● **MORE ACCURATE** torque control with uniform results. Quick, easy adjustment ...tamperproof. ● **ASK FOR DEMONSTRATION** of the J-42T to see how this outstanding development can cut costs on your assembly line. Write The Rotor Tool Co., 26345 Lakeland Blvd., Cleveland 32, Ohio. Subsidiary of The Cooper-Bessemer Corp.

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CIRCLE INFORM-A-GRAM KEY NO. 1131

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BEND WITH PEDRICK

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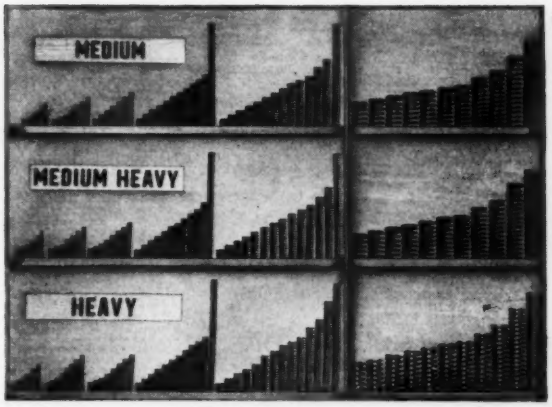

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6001

Fine quality die springs carried in stock —wide selection of hole and rod sizes, lengths and deflections. Three pressure ranges — medium, medium-heavy, heavy. Long life reduces downtime.

Write for free list of stock sizes, prices, and name of nearest distributor.

Raymond Manufacturing Division
Associated Spring Corporation
Corry, Pennsylvania

CIRCLE INFORM-A-GRAM KEY NO. 1133

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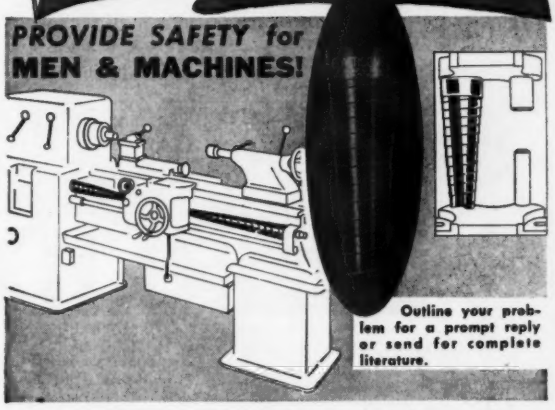

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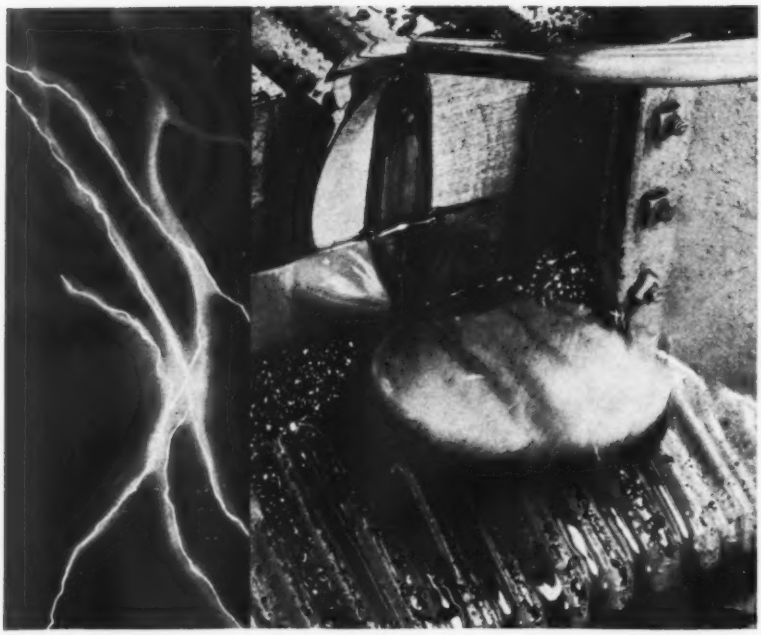
CIRCLE INFORM-A-GRAM KEY NO. 1134



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Your hack sawing machines will produce faster cutting-off on all types of work when they are equipped with unbreakable Marvel High-Speed-Edge Hack Saw Blades.

Why? Because these are the blades specifically designed to take the high speeds and heavier feed pressures demanded by today's production schedules.

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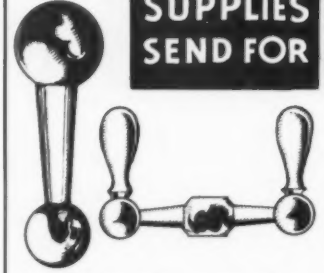


This large Free 88 page catalog lists 2200 items which will enable you to substantially increase the efficiency of your tool room and improve the attractiveness of your products. It also describes many new and ingenious devices for speeding up work and lowering production costs.

This interesting catalog describes a variety of handles such as plastic ball, malleable machine, C.I. Hand Knobs, etc. Also compression spring assortments, clamping levers, ball plungers, etc.

Orders welcome for one or a thousand.

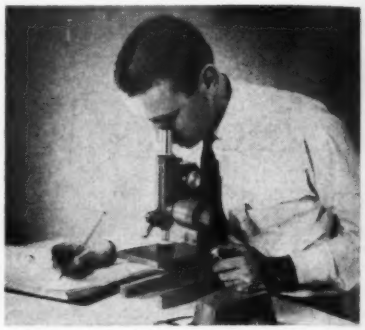
REID TOOL SUPPLY COMPANY
MUSKEGON HEIGHTS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1142

Product News

Budget Microscope

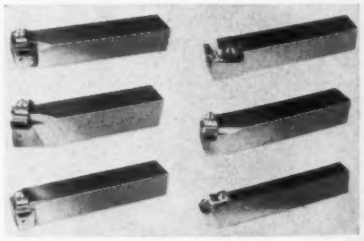
STM is a professional, yet budget-priced microscope for the study of opaque objects. In industry it's useful because it frees larger equipment for research. The large, low-positioned stage (115 mm x 140 mm accepts specimens



up to 1¼" thick. It's designed for an optional mechanical stage attachment. Model STM-2 has a 10X Huygenian eyepiece. Model STM-3 with triple nosepiece contains 7.5X and 12.5X eyepieces. The latter model is recommended for examining the structure of more complex metal specimens. Write Bausch & Lomb Inc., Rochester 2, N.Y. for Brochure D-112. Or Inform-A-Gram No. P38.

A Better Turn

Hi-Shear turning tools that promise better cutting action on aluminum, titanium, stainless steel, refractory metals and a variety of materials, have been introduced by Valenite Metals, Box 205, Royal Oak, Mich. Features are positive



rake angles up to 13° with lapped inserts and chipbreakers. Patterned after Valenite's throwaway insert turning tools, the Hi-Shear tools come in six standard holder styles and 29 sizes. Offered for both right and left hand cutting. Write the makers, or circle Inform-A-Gram No. P39.

Extend the Length of Standard Taps with WALTON EXTENSIONS

SAVE THE COST OF SPECIAL TAPS

Walton Tap Extensions are "money-savers" for those with tapping problems . . . in deep holes or awkward locations. Often standard taps do not reach, and usually there is no turning space for a tap wrench. Extensions will provide needed length, save lost time, and the expense of special "long" taps.

STYLE "A" for Hand Tapping Only

Eleven sizes fit all standard hand taps, all flute styles, from 3/16" (#10) to 1" inclusive. Each size packaged as a set of two 5" extensions for use singly (lengthens tap 5") or in combination (lengthens tap 10").

STYLE "B" for Machine & Hand Tapping

Single units fit together into a rigid, closely aligned assembly. With a set of 9 extensions, as many as 4 can be coupled together to form an extension up to 28¼" long. Adaptable to all standard taps from #0 to ½".

Stock Walton Tap Extensions as insurance against costly tapping problems in your shop. Or try them at our expense (ask about free trial offer) and rate them for a place in your tool crib.

Write for Data Folder No. 38

WALTON TOOLS SINCE 1908 HARTFORD, CONN.

THE WALTON CO. HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1151

$895

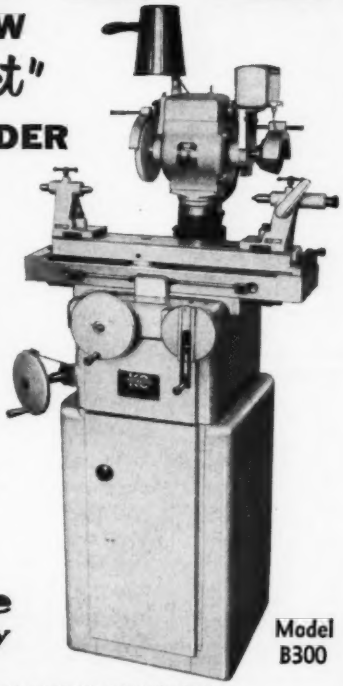
BUYS NEW "Compact" TOOL GRINDER

This precision engineered grinder is guaranteed to do anything that machines costing two or three times more will do.

Its compactness makes it easier to work on, easier to change set-ups, easier to hold accuracy, easier to turn out more work. It will take work up to 17½" long between centers with 8¼" swing that can be easily increased to 10¼" with 1" raising blocks. Table Traverse 10". Cross Feed 5".

This fine machine has the necessary capacity to handle all the tool and cutter grinding in the average shop.

Available with Universal Grinding Spindle Head, speeds 3450 to 20,700 R.P.M. at additional price.



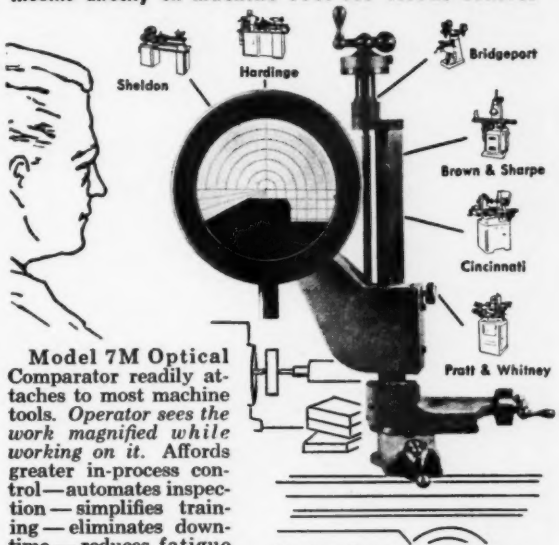
K.O. Lee Company
ABERDEEN, S. D.

Model B300

CIRCLE INFORM-A-GRAM KEY NO. 1152

Optical Comparator

mounts directly on Machine Tool for Visual Control



Model 7M Optical Comparator readily attaches to most machine tools. *Operator sees the work magnified while working on it.* Affords greater in-process control—automates inspection—simplifies training—eliminates downtime—reduces fatigue—allows you to do work you otherwise might not be able to do.

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Special OEM engineering available.

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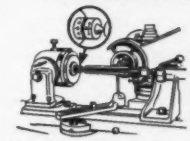
NEW . . . fast, easy CENTER ALIGNMENT

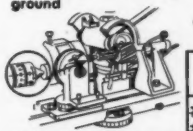
for LATHES and GRINDERS

Center being used on grinder

The Enco Micro-Set® Adjustable Center



Taper reamer being ground



Helical milling cutter being reground

- permits TRUE work alignment from tailstock or headstock on: cylindrical grinders, cutter grinders, gear shavers, lathes and tracer attachments.
- Saves one half the set-up time.
- Ends hit or miss table adjustments to obtain precise alignment.
- An inexperienced operator can get a precise alignment—easily—in seconds.
- Quickly pays for itself in time and scrap savings

Morse Taper	Brown & Sharpe	Jarno
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We also manufacture Precision Lathe Turrets and Tiny-Titan Magnetic Base Holders.

Enco MANUFACTURING CO. Dept. 7111, 4520 W. Fullerton Ave., Chicago 39, Ill.

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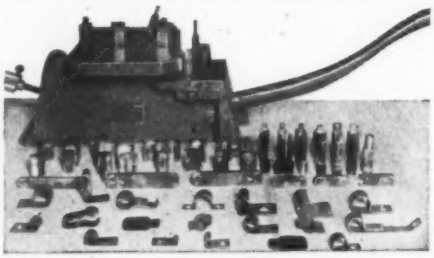

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Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

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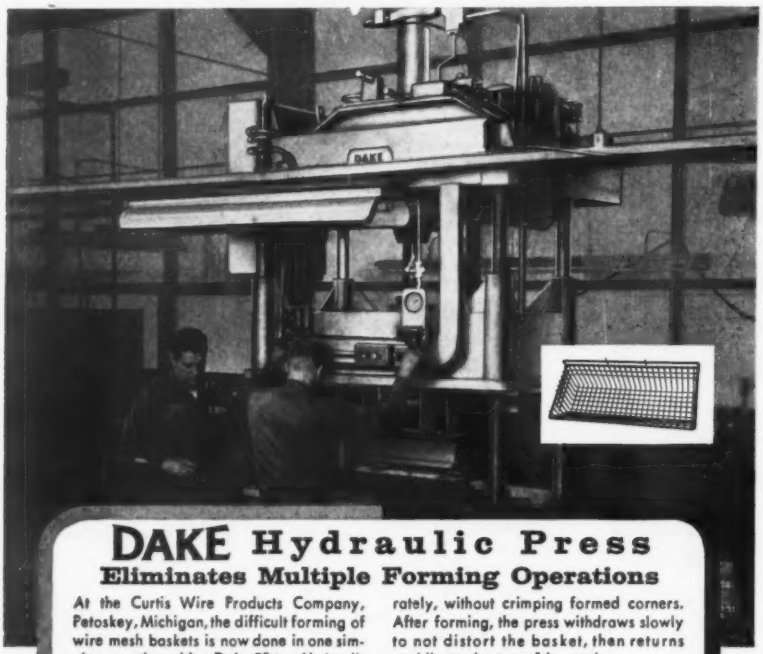


DAKE Hydraulic Press

Eliminates Multiple Forming Operations

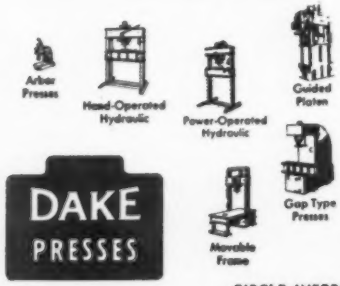
At the Curtis Wire Products Company, Petoskey, Michigan, the difficult forming of wire mesh baskets is now done in one simple operation with a Dake 50-ton *Hydraulic* Guided Platen Press. The Dake Press saves considerable production time per basket by eliminating previous operations which formed only one side at a time.

The preset cycle of the Dake Press eliminates any possibility of operator error. After the wire mesh is placed in the die, the operator presses dual palm buttons which close the press rapidly until just before the wire mesh is contacted. It then slows to an adjustable pressing speed and forms the material smoothly and accurately, without crimping formed corners. After forming, the press withdraws slowly to not distort the basket, then returns rapidly to the top of its stroke.

Every feature of a Dake Press is designed to save production time. The press stroke may be set to eliminate unnecessary travel. Rapid advance and rapid return increase the pressing cycle. Large bed area with ample daylight provides easy insertion and removal of pressed parts.

Dake Presses are available in capacities from 25 to 600 tons. For special applications, investigate the Dake line of Custom-Engineered Presses. Write for Catalog.

DAKE CORPORATION 634 Robbins Road, Grand Haven, Mich.



DAKE PRESSES

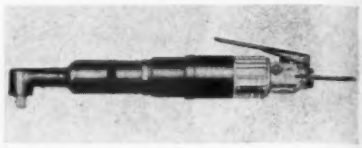
DAKE CORPORATION
634 Robbins Road, Grand Haven, Mich.
Please send me a copy of Dake Catalog No. 415.
Name_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1162

Product News

Automatic Clutch

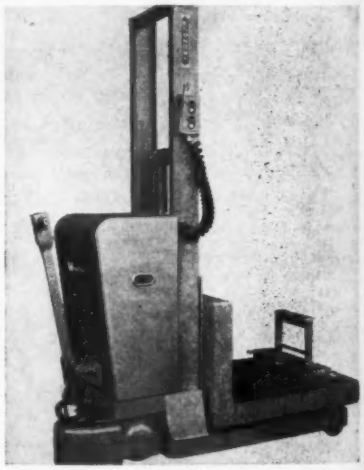
A new fastening tool with a right angle head and a torque control clutch has joined the 31W series of nutrunner and screwdrivers by Buckeye Tool Corp., 5003 Springboro Pike, Dayton 1, Ohio. The automatically controlled clutch is adjustable for any desired torque



from 5 to 100 in-lbs. Its jaws disengage automatically when pre-set torque is reached. Re-engagement starts with release of the lever throttle. The ¼" machine screw tool is available in 6 models—¼ and ⅜" square drive and ¼" female hex at both 500 and 1300 rpm speeds. Write, or circle Inform-A-Gram No. P40.

Walkie-Worklifter

Now every die shop can fully automate the dangerous job of handling dies. Although special lift trucks for die moving are not new, the size of the Economy Walkie Worklifter is. This unit was specifically designed for medium weight



loads up to 2000 lbs. The operator does no manual lifting, pushing or pulling. He merely pushes a button. The truck combines both lifting and horizontal powered travel with moving heavy dies on and off the load platform. Economy Engineering Co., 4509 W. Lake St., Chicago 24, Ill., or No. P41.

NOW NEW Slip Spindles ON ZAGAR HEADS for drilling, reaming, tapping

Spindle locations can be changed quickly, easily, on Zagar gearless heads. Rigidity is retained in a compact, low height head. Varying patterns can be economically machined with one head, adaptable to any standard drill press.

A minimum of spindle extension keeps head height down.

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Quality Control plus Cost Control

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- Full set of lenses between 10x and 100x magnification.
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- Detachable shelf optional.

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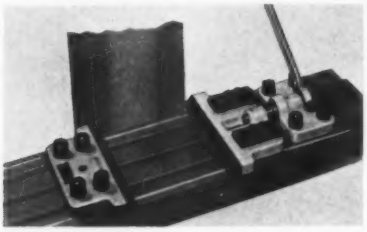
JERGENS TOOL SPECIALTY CO.
Dept. TP-11, 712 E. 163rd St., Cleveland 10, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 1173

Product News

Toss Away Clamps

The entire work surface is freed of clamps, bolts, washers, and nuts, with a new vise. The unit holds plates, castings, and parts beyond the capacities of standard vises. Tightening is simplified with the 10″ ratchet handle and a roller thrust bearing on the jack screw.



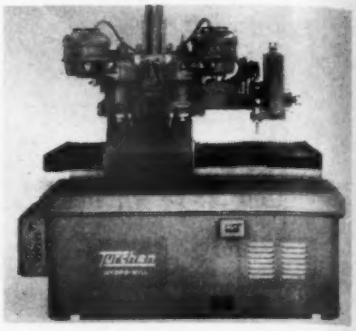
The sliding jaw unit has a 1″ travel. It comes with two types of 10″ wide interchangeable hold-down jaws. Vise can be assembled on a made-to-order base plate for cross mounting. It's an ideal accessory for planer type grinders for holding of non-ferrous bars. Illinois Metal Products, 429 W. Superior St., Chicago 10, Ill. Or Inform-A-Gram No. P42.

Vacuum Furnace

A new high-temperature vacuum-atmosphere furnace has a maximum operating temperature of 2000°F at 29 Hg vacuum. Clear work space is 12 x 12 x 20″. Alloy

radiation shields are provided for insulation and the outer chamber is water-cooled. The furnace has a variety of applications, and comes in various work chamber sizes and lower vacuums upon request. From K. H. Huppert Co., Dept TP-3, 6840 Cottage Grove Ave., Chicago 37, Ill. No. P43.

Traces Large Parts



Hydro-Mill traces three dimensions on both spindles. With up to 5-hp motors available for each spindle, speeds of 150 to 11,750 rpm are possible. This makes the unit suitable for machining tough metals, non-ferrous metals, and grinding, if desired. The 20¾ x 78¼″ stationary work table accommodates parts and models up to 13 x 36 x 12″. Distance between centers is 18″. A tracer controls hydraulic actuators on the vertical slide, saddle and ram, and allows for combination profiling and contouring. Literature from Turchan Follower Machine Co., Box 157, Inkster, Mich. No. P44.

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—all are ready to save you time and money
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PRECISION MADE
ECCENTRIC LEVELING LUGS by turning the eccentric pad is brought in line
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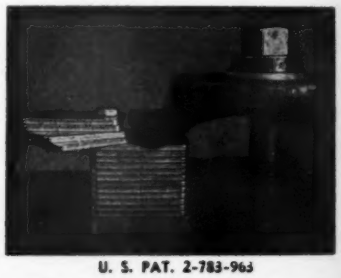
HANDY ADJUSTABLE

RISER BLOCKS



U. S. PAT. 2-783-963

for FASTER—SAFER—CHEAPER SETUPS

Use on Drill Presses—Milling Machines—Punch Presses—Surface Grinders—Planers, etc. End lost time looking for right height odds and ends.

HANDY RISER BLOCKS

- Give heights from ⅜″ to 2⅜″ in ⅛″ increments.
- Cut setup time by eliminating haphazard blocking.
- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

ORDER TODAY. USE THIS COUPON.

HANDY PRODUCTS
P.O. Box 3537T, Cleveland 18, Ohio

Gentlemen: Please ship ..... pairs of RISER BLOCKS.
Company .....
By ..... Title .....
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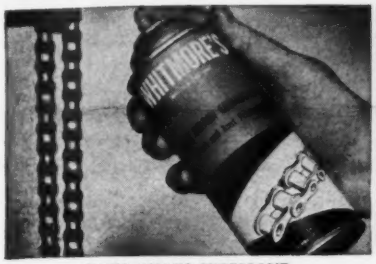
Open account shipments to rated companies. Otherwise, payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax.

TRIAL SAMPLES
Of World-Famous WHITMORE'S Lubricants



OPEN CHAIN LUBRICANT INCREASES CHAIN LIFE UP TO 300%

Penetrates, lubricates, prevents rust. Lubricates deep into chain linkage to reduce friction on pins, rollers, bushings, pressure surfaces. Corrosion inhibitor prevents rust in vital working mechanisms. Lubricates close-tolerance internal surfaces to increase chain life up to 300%. Highly recommended for all climatic conditions to stop rust and corrosion even in salt atmospheres.

Packaged in handy 16 oz. aerosol spray-on containers or in bulk—send for a free trial sample.

ANTI-FRICTION COMPOSITIONS HAVE NO MELTING OR DROPPING POINT

Packaged in 14½ oz. cartridges for handy application with lever-type cartridge guns for constant protection to roller, ball, sleeve bearings and sliding surfaces in "hot" bearing applications or in areas with high ambient heat. Exclusive formulas have no melting or dropping point; moisture resistant; will not wash out; exceptional metal adherence properties; temperature reducing qualities; high extreme pressure values. Available in two grades. Whitmore's Anti-Friction Composition No. 1 (light density), recommended for high speed, high temperature applications. Anti-Friction Composition No. 2 (heavy density), for low-speed high-temperature applications or loosely-fitted bearings. Specify No. when requesting free trial sample.

68 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

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- Speed Reducers
- Enclosed Gear Cases
- Roller, Ball and Sleeve Bearings
- Wire Rope and Cable
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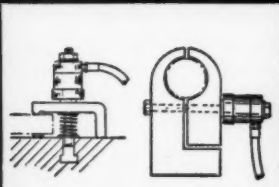
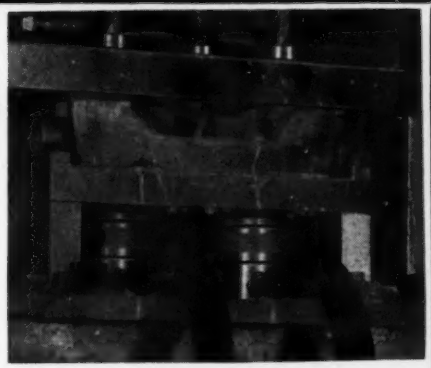
CIRCLE INFORM-A-GRAM KEY NO. 1191





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- Compact—Build into fixtures easily
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- Greater locking force than any other method
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- Single or multiple locking heads available with matching air-hydraulic booster systems.

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CIRCLE INFORM-A-GRAM KEY NO. 1192

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LARGEST STOCK OF
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Also in Stock:
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Write Today for WALL CHART Special Taps Also Made to Your Print Specifications

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NEW! ONLY ..... **$15** ★

Buys This Compact Mist Coolant Unit

TRICO TYPE "J"

*Complete With Magnetic Nozzle Holder As Shown (in U.S.A.)

Especially designed for small precision machinery used for drilling, tapping, sawing, grinding, etc. Up to 500% savings through increased cutting speeds and tool life. Check these quality features and write for complete details.

- ***compact . . . measures 3" x 5"***
- ***separate air and coolant controls***
- ***convenient mounting stud***
- ***attaches to existing shop airline***
- ***shatter-proof 8 oz. reservoir***
- ***neoprene flexible coolant line***
- ***magnetic nozzle holder positions anywhere***
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Larger Types and Capacities Available

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Anything new in Diamond Wheels?

YOU BET . . . the NEW "BH" RESINOID BOND

FOR TOOL AND CUTTER GRINDING

INCREASE WHEEL LIFE 50%

You can remove more stock, faster, with less wheel wear, when you use the new PRECISION "BH" Resinoid Bonded Tool and Cutter Diamond Wheels.

This is another PRECISION first in industry. By radically new production methods, the diamond cutting particles are attached to the resinoid bond. It wets and holds the diamonds. Users report up to 50% increased wheel life.

Ask for and try the following grade: MD150 N100 BH.

SEND US SATISFACTION GUARANTEED ORDERS. MAKE US PROVE THESE FACTS.

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CIRCLE INFORM-A-GRAM KEY NO. 1201

TOMCO INC.

HAND WHEELS

Straight Type Offset Type

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

HORIZONTAL

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use $89.95

Work table in vert. illus. optional.

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

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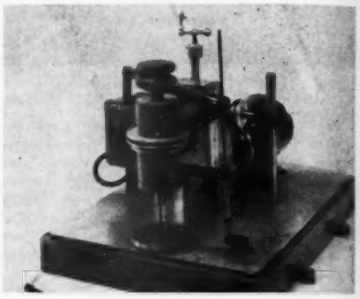
CIRCLE INFORM-A-GRAM KEY NO. 1203

Product News

Finger-Touch Control

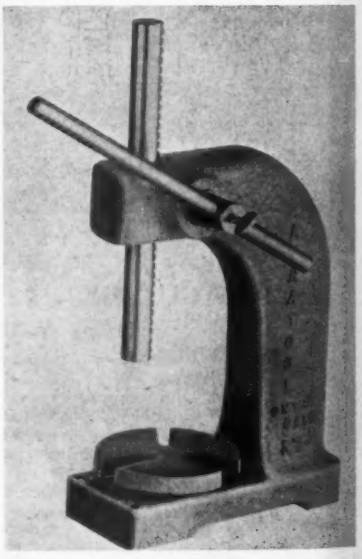
A new micro drill press has finger-touch control for more sensitive drilling of small parts. The unit has a throat depth of 4½" and 1¼" spindle travel. The column has a micrometer screw and adjusts to 2" in thousandths. Powered



by a 1/12-hp motor, the press takes standard Magnus-Elect collets from 0.004 to 0.315. Special accuracy collets to 0.0001 are also available. Write F. W. Derbyshire, Inc., 265 Bear Hill Rd., Waltham 54, Mass. Inform-A-Gram No. P45.

Hand Arbor Press

A new hand-operated Arbor press can rivet, seat bearings, and bushings, cut wire in electronic, miniature and sub-miniature assembly work. Inside height is 5¼" and working throat depth 2½".



The press has a ⅝" dia arbor concentric with a 1" hole in the base. It's supplied with four 13/64" base mounting holes from Acratool, Inc., 1114 E. Emporia, Ontario, Calif. Inform-A-Gram No. P46.

HARDENED and GROUND HSS BLANKS

Any decimal diameter — any length. Mirror finish surface to gage tolerance.

Many uses — core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

Write or phone DRexell 6-4223 for price list D-3

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CIRCLE INFORM-A-GRAM KEY NO. 1211

THE BOREMASTER for ACCURATE TREPANNING

Bores Holes and Cores in ONE OPERATION

- ★ Bores 6" hole in 3¼" steel in 6 minutes.
- ★ Bores 5" hole in boiler-plate in 80 seconds.
- ★ Rigid; Heavy-duty; Easy cutting; Timesaver.
- ★ Excellent chip load distribution.
- ★ 5 Sizes, 1½" to 11¾" to 8" depth.
- ★ With or without retractable pilot.
- ★ **Write for FREE catalog.**

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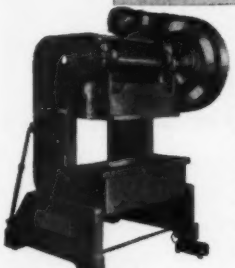
NEISE MODERN TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1212

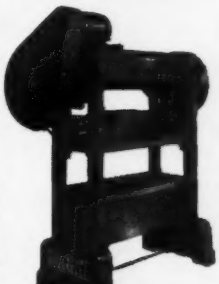
High-Output with ROUSSELLE

DOUBLE-CRANK PRESSES



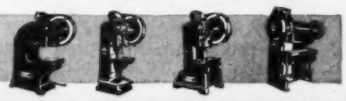
No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



STRAIGHT SIDE — Die space up to 24 in.; bed space up to 6 ft. between uprights.

Choice of over 30 models and types in 5 to 60-ton sizes

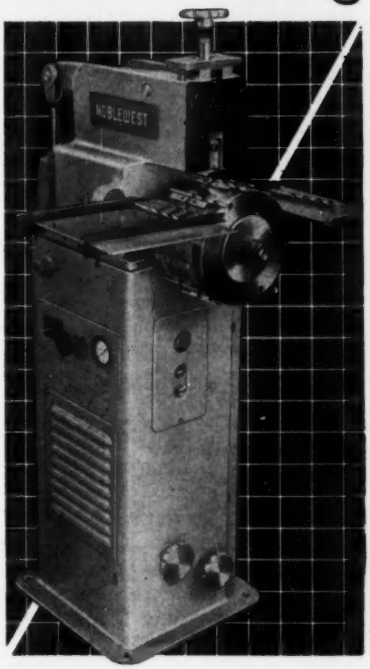


SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

CIRCLE INFORM-A-GRAM KEY NO. 1213

high speed metal marking



precision marks up to 10,000 per hour

For marking drills, rods, and similar shaped work pieces, this Series 19 Model 562 Vertical Dial Roll Marking Machine is unsurpassed for capacity, ease of operation, quality of marking. Marks permanently indented impressions. Features include air loaded marking head, and universal carrier dial to accommodate parts from 1/16" to 1/2" diameter. Other models for every marking requirement. Write for literature.

Noblewest makes finest quality dies at competitive prices for all marking purposes

NOBLE & WESTBROOK MANUFACTURING COMPANY

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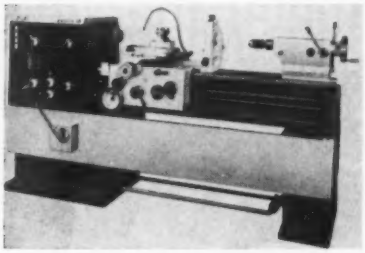
* mark it best with NOBLEWEST

CIRCLE INFORM-A-GRAM KEY NO. 1214

Product News

Consistently Accurate

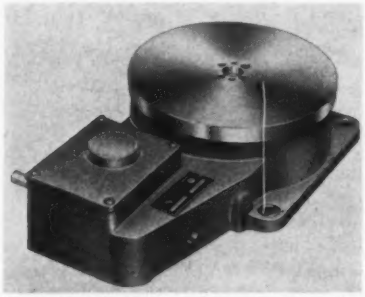


Mondiale engine lathes are precision-built for sustained accuracy and efficiency. Alina Corp., 122 E. Second St., Mineola, N.Y., praises the units' ruggedness, economy, functional design, easy operation, standard spindle nose, hardened and ground ways, and the heavy ribbed bed. The units come in five different models. Write the makers, or mark Inform-A-Gram No. P47.

The Inform-A-Gram Cards are for your convenience in making inquiries regarding Advertised Products and Editorial Articles.

Slow Starts and Stops

Ideal index motion and slow starts and stops are provided by a new group of 10 and 18″ index tables. According to Jackson Fluid Power Co., 16722 E. Warren Ave.,

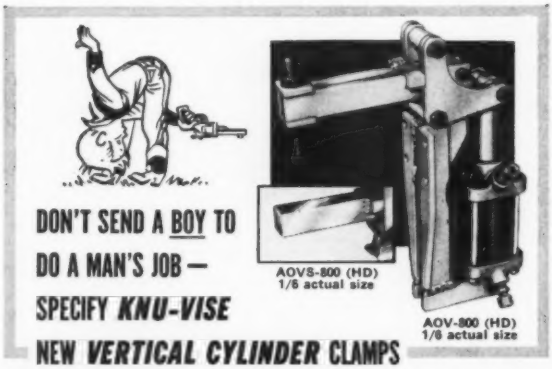


Detroit 24, Mich., they feature the smallest number of working parts ever designed into an index table. On continuous operation the index table is equal to the locking or work cycle time, but any requirements may be obtained. Index time with slow start and slow stop can be as brief as ⅛ of a second, or longer. There's a choice of stations: up to 16 stations on the 10″ tables and up to 36 stations on the 18″ tables. Write the makers, or mark Inform-A-Gram No. P48.

Out-of-Round Checking

New dial indicating groove diameter gages are self centering and direct measuring. They may be used for dimensional control of O-ring grooves, or for checking out-of-round condition, tapered or bell-

mouthed holes, recesses in blind holes, and inside spherical radii. They check close tolerance ID's quickly. Several models are offered for measuring a total range of ID's from 0.157 to 4⅞″. Write Boice Gages, Inc., Hyde Park, N.Y. Inform-A-Gram No. P49.



DON'T SEND A BOY TO DO A MAN'S JOB — SPECIFY *KNU-VISE* NEW *VERTICAL CYLINDER* CLAMPS

Tough, rugged and designed to do a man-sized clamping job — that's the *new* line of *vertical cylinder* air or oil operated clamps now being manufactured by Lapeer Knu-Vise.

The all new Heavy Duty AOV Series, features three basic sizes of 200, 400 and 800 lbs. clamping force respectively. Each size may be specified with either solid (inset) or channel toggle bars and spindle assembly (top).

Like all Knu-Vise products these powerful new vertical cylinder heavy-duty clamps were designed to give outstanding performance under the toughest manufacturing conditions. Such features as HARDENED AND GROUND BEARING BOLTS . . . HARDENED STEEL BUSHINGS . . . SELF-LOCKING NUTS FOR "TAKE-UP OF PLAY" . . . TOGGLE BARS MADE FROM COLD ROLLED STEEL . . . and EASY PARTS REPLACEMENT all assure you that when you specify Lapeer's KNU-VISE PRODUCTS you're "sending a man to do a man's job." Write today for complete information.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

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CIRCLE INFORM-A-GRAM KEY NO. 1221

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Lassy Tappers make tapping easy, fast and simple. Exclusive patented features eliminate guess work, drastically reduce labor costs, save taps.

3 SIZES.

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UNCONDITIONALLY GUARANTEED

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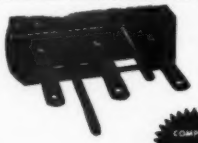

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COMPLETE LEAD HAMMER SERVICE

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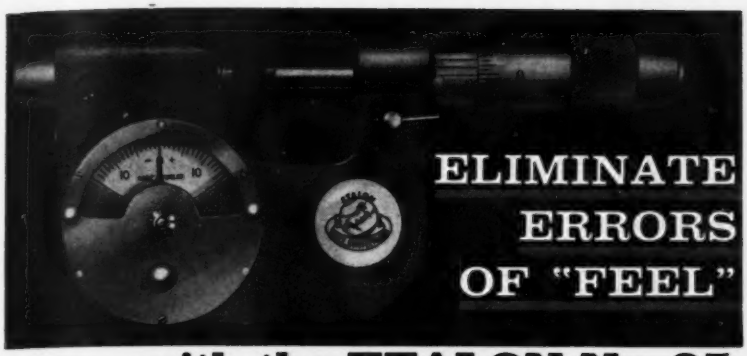

with the ETALON No. 25

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A rugged instrument designed to combine the precision of a dial indicator with the accuracy of the micrometer screw.

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- To simplify fine adjustment, the dial can be rotated so that the "O" may always be placed under the hand.
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- Jewelled and shock proof.
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It pays to specify

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Carbide Tipped and Solid Carbide
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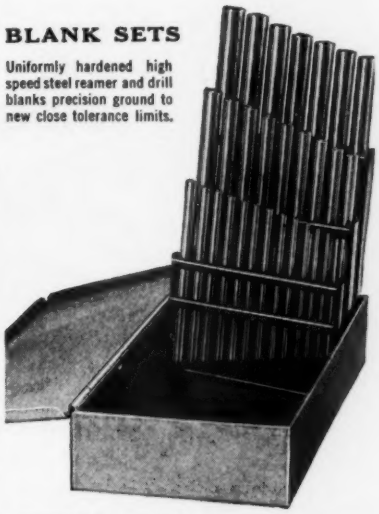
BLANK SETS

Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits.



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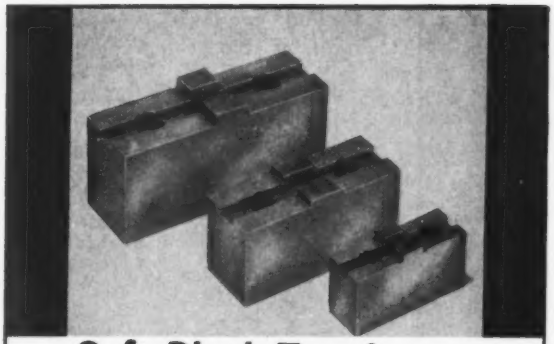

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THE JOB:
Tap 4 6-32 holes 11/16" deep in the hubs of production run, heat treated gears.

THE PROBLEM:
Excessive breakage of the specially relieved taps used to handle the unusual depth-to-diameter tapping job . . . spoiled parts . . . high costs. A number of different tappers were tried, but the problem remained.

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1700 pieces were tapped without breaking a single tap. Tolerances were held and a very high rate of production was maintained.
This is typical of the performance a Commander Tapper can produce.
The extreme sensitivity, and wide range of adaptability of a Commander Tapper can be put to work for you; ask your nearby Commander Distributor for a demonstration.

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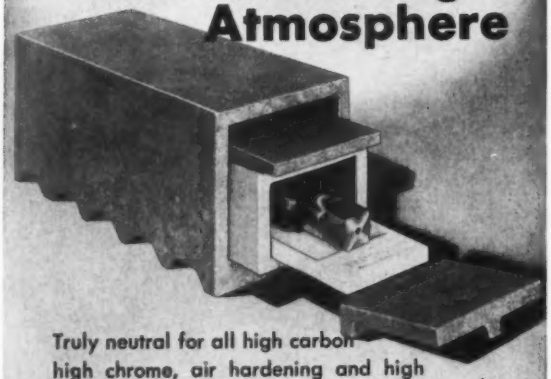
Sentry
TRADEMARK

DIAMOND BLOCK® Tool Hardening Atmosphere



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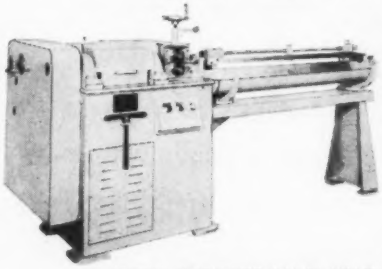
1V18 Shuster Production Booster

Capacity .062" To .125"



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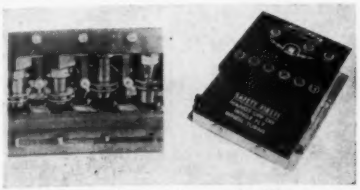
Boulevard Industrial Park
New Haven, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1244

Product News

It Minds Dies

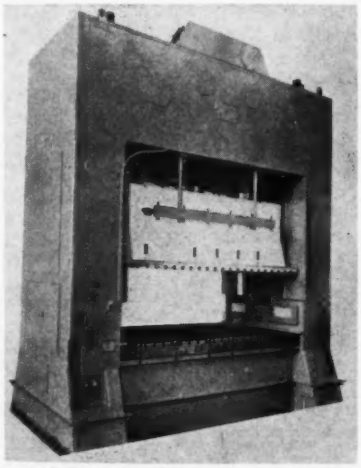
Now a press operator can track malfunctions in slide transfer machines immediately. An improved electronic device signals location of trouble via a flashing light on the control panel. The new control eliminates die damage, downtime, and press slowdowns. The



Auto-transfer automatically compensates for temperature changes, voltage fluctuations, and normal mechanical changes that may occur during press warm-up time. Built-in auxiliary units also protect operating machinery from buckling, end-of-material, and misfeed. Write Wintriss Controls, Div., Industrionics Controls, Inc., 20-24 Vandam St., New York 13, N.Y. Inform-A-Gram No. P50.

Press

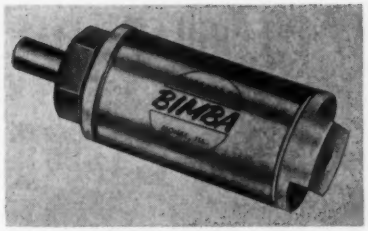
A new 400-ton 2-point press has full eccentric drive and no crankshaft. It's said to deliver greater torque and maintain greater production accuracy, because of its box-type slide and barrel slide adjustment. Slides are counter-bal-



anced by air. The press operates at 18 strokes/min, has a bed area of 132 x 72" and a 20" stroke of slide with a 10" adjustment. Write Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio. Inform-A-Gram No. P51.

Spring Return Air Cylinders

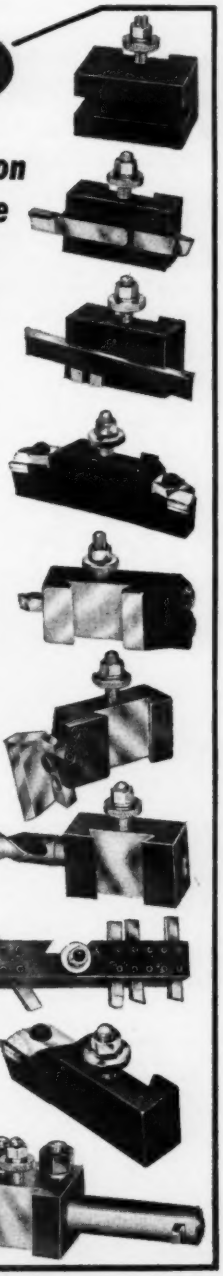
Air cylinders that are single acting, spring returned, are now offered in 1½" bores size up to 3" stroke lengths. The units have a ¾-16 hex nut for front nose mounting. The stainless steel body, U-cup mounted in aluminum alloy piston, and rolled in front and rear head design, are said to extend life expectancy. Full information



from Bimba Mfg. Co., 101 Main St., Monee, Ill., or Inform-A-Gram No. P52.

ALORIS

Super Precision quick-change Tool Post and Tool Holders



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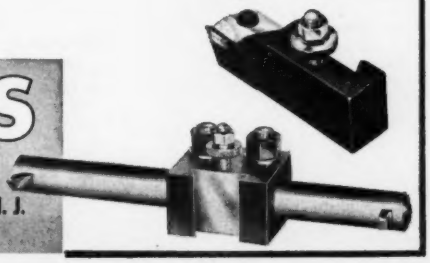

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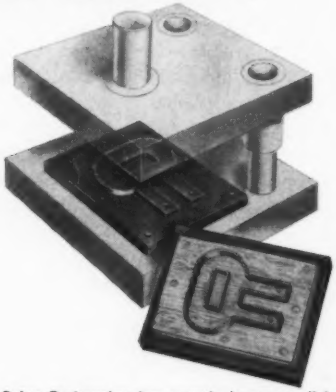

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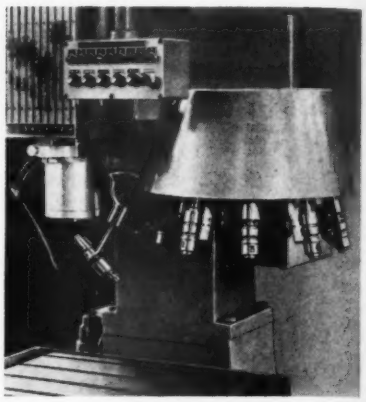
CIRCLE INFORM-A-GRAM KEY NO. 1262

Product News

5-Second Tool Changer

A new automatic tool changer has been developed as an accessory for the Edlund-Matic Model 2N drilling and tapping machine. According to Edlund Machinery Co., Cortland, N.Y., the new tape-controlled unit will speed drilling and tapping operations by automatically changing tools in 5 sec. It frees



operator for other work. Tools may be selected out of sequence as required by the tape. The versatile tool can carry up to nine different cutting tools. When a tool change is signaled by the tape, two pneumatically controlled fingers grip the adapter in the spindle, and release it via air pressure control. More from the maker, or Inform-A-Gram No. P53.

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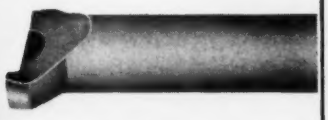

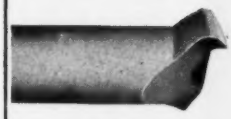

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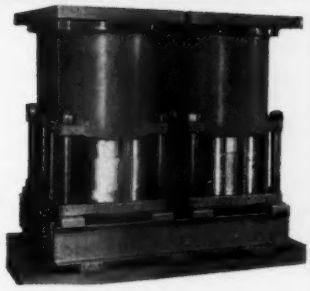

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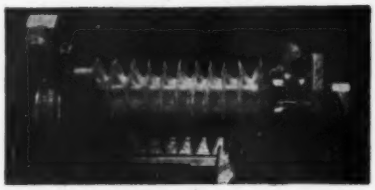

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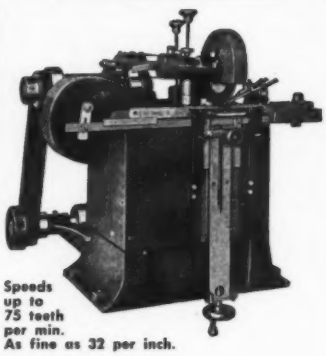

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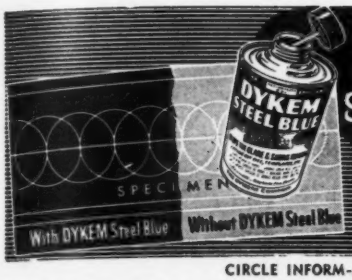
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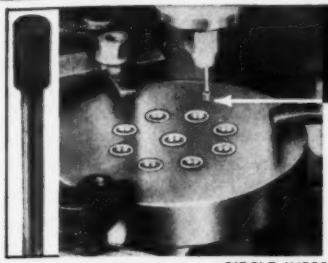

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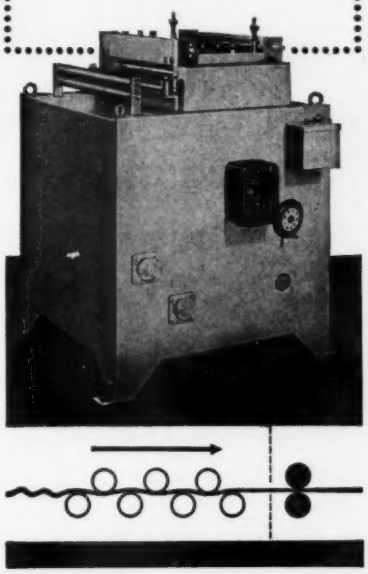

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WHY WAIT?

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TAPS • DIES • THREAD PLUG & RING GAGES

NEW SIZES ADDED DAILY . . . IF NOT LISTED— WRITE

DEALER INQUIRIES INVITED

WHEN REQUESTING QUOTATIONS ALWAYS MENTION QUANTITIES

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-80-90
1	48-56-60-64-80-90
2	48-52-54-56-60-72-80-96
3	36-40-60-64-72-80
4	30-32-38-42-44-56-60-64-72-80-90
5	22-27-30-32-36-38-42-48-50-56-60-64-72-80
6	24-28-30-36-38-42-44-48-56-60-64-72-80
7	28-30-32-34-36-38-40-44-48-64
8	24-26-28-30-38-40-44-48-56-60-64-72-80
9	24-28-30-32-36-40
10	18-20-22-26-28-30-34-36-40-48-56-60-64-72-80-96
11	20-22-26-27-30-32-36-40
12	20-22-26-27-30-32-36-38-40-48-56-60-64-72-80
13	20-22-24-28-32-40
14	14-16-18-26-28-30-32-36-40-64
15	18-20-24-28-32-40
16	16-18-20-22-24-28-32-36
17	16-20
18	16-18-20-24-32-40
19	18-20
20	14-16-18-20-24-32
22	16-18-20-24
24	14-16-18-22-24
26	14-16-20-24
28	14-16-20
30	14-16-20
1/16	56-60-64-72
5/64	56-60-64-72
3/32	32-36-38-48-50-56-60-64
100	100
.107	52
7/64	36-40-42-44-48-50-56
1/8	30-32-36-38-40-48-56-60-80
.132	50
9/64	30-32-38-40
.148	38
5/32	24-26-28-30-32-36-38-40-50
11/64	24-26-30-32-36-38-40
3/16	12-18-20-22-24-26-27-28-

SIZE	THREADS PER INCH
3/16	30-32-36-40-48-56-64-72
.198	24
13/64	24-28-30-32-36-40
7/32	20-22-24-26-27-28-30-32-36-38-40-56-60-64-72
.227	24
15/64	20-22-24-28-32-36
.246	40
1/4	10-12-14-16-18-22-23-24-25-26-27-30-32-36-38-40-44-48-50-56-60-64-72-80
17/64	12-18-20-24-27-28-32-40
.277	40
9/32	16-18-20-24-26-27-28-32-36-40-46-56
19/64	18-24
.300	28
5/16	10-12-14-16-20-22-26-27-28-30-32-36-40-44-48-50-56-64
21/64	16-18-20-24-36
11/32	16-18-20-22-24-26-27-28-32-36-40-64
23/64	16-24
.365	28
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7/16	10-12-16-18-22-24-26-27-28-30-32-36-40-48-56
29/64	12-14-16-20
15/32	12-14-18-20-24-27-28-32-36-40
31/64	12-13-20-24-32
1/2	10-11-12-14-16-18-22-24-26-27-28-30-32-36-40-44-48-56-70-72-80
33/64	12-13-20-24
17/32	10-12-13-14-16-18-20-24-27-28-32-40-64
.550	24
9/16	10-13-14-16-20-24-26-27-28-30-32-36-40-48-56-80
37/64	10-12-18-20-27
19/32	12-18-20-24-28-32-36-40

SIZE	THREADS PER INCH
5/8	9-10-12-13-14-16-20-24-26-27-28-30-32-36-40-48-56-64
41/64	11-18-24-32
21/32	10-11-18-20-24-27-32-40-48
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11/16	10-11-12-14-16-18-20-22-24-26-27-28-30-32-36-40
23/32	11-12-16-18-20-24-27-32-36-40
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25/32	10-12-16-18-20-24-27-32-40
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55/64	6-12
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31/32	8-9-12-14-16-18-20-24-28-32
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1-1/8	8-10-14-16-18-20-24-27-28-32-40-48
1-5/32	7-8-9-12-14-16-18-20-24-32
1-11/64	18
1-3/16	7-8-10-12-14-16-18-20-24-27-28-32-40
1-1/4	8-10-14-16-18-20-24-27-28-32-40
1-5/16	6-7-8-10-12-14-16-18-20-24-27-28-32-40-48
1-3/8	5-8-10-14-16-18-20-24-27-28-32-40
1-13/32	12-16-18-20
1-7/16	6-8-10-12-14-16-18-20-24-27-28-32-40

SIZE	THREADS PER INCH
1-1/2	7-8-9-10-13-14-16-18-20-24-27-28-32-40
1-17/32	7-12-16-18-20
1-9/16	6-8-10-12-14-16-18-20-24-32-40
1-5/8	5-5¼-6-8-10-11¼-12-13-14-16-18-20-24-28-32-40
1-11/16	8-10-12-14-16-18-20-24-32
1-23/32	5-8-12-16-18-20
1-3/4	5-6-8-10-12-13-14-16-18-20-24-28-32-40
1.767	18
1.7715	12
1-13/16	8-10-12-14-16-18-20-24-32
1-7/8	5-6-8-10-12-14-16-18-20-24-32
1-29/32	12-16-18-20-32
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2-1/8	4¼-8-10-12-14-16-18-20-32
2-3/16	8-10-12-14-16-18-20-24
2-1/4	4¼-8-10-12-14-16-18-20-24
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2-11/16	8-10-12-14-16-18-20-32
2-3/4	4-8-10-12-14-16-18-20-32
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2-15/16	8-10-12-14-16-18-20-32
3	3¼-4-8-10-12-14-16-18-20
3-1/16	4-8-10-12-14-16-20
3-1/8	4-8-10-12-14-16-20
3-3/16	4-8-10-12-14-16-20
3-1/4	4-8-10-11-12-14-16-18-20
3-3/8	4-8-10-12-16
3-1/2	4-8-10-12-16
3-5/8	4-8-10-12-16
3-3/4	4-8-10-12-16
3-7/8	4-8-10-12-16
4	4-6-8-10-12-16
4-1/8	4-8-10-12-16
4-1/4	4-8-10-12-16

Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus .002, .003, .005
MACHINE SCREW	#6 to #14	Plus or Minus .003, .005, .010
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus .003, .005, .010 .015, 1/64, 1/32

Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NC	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 NF
11/16	11 NS, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF

Right Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24 NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16 NF
5/16	24 NF	Also Larger Sizes	NC & NF

UNLISTED Right Hand "Pipe" Taps

"NPT" Taper "NPT" Size	Thread
1/16	27
1/4	27
2-1/2	8
3	8
3-1/2	8
4	8
Also British	

"NPS" Size	Thread
1/16	27
1	8
1-1/4	11½
1-1/2	11½
2	11½
2-1/2	8
3	8
3-1/2	8
4	8
Also British	

EX. LENGTH "NPT" & "NPS" Size	Thread
1/16	27
1/8	27
1/4	18
3/8	18
1/2	14
3/4	14
1	11½

Left Hand 'Pipe Taps' Taper and Straight

Size	Thread
1/16	27
1/8	27
1/4	18
3/8	18
1/2	14
3/4	14
Also British	

Size	Thread
1	11½
1-1/4	11½
1-1/2	11½
2	11½
2-1/2	8
3	8
3-1/2	8
Also British	

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- ☑ QUALITY
- ☑ PRICE

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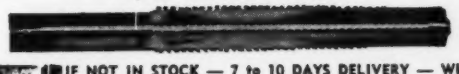

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(a) Kind of material being machined. (b) Depth of hole in inches, through or bottom hole. (c) Tap to be used horizontally or vertically. (d) Will tap turn, or is piece expected to be turned. (e) Is tapping job expected to be done in one pass. (f) Would tap be backed out of hole, or machine stopped for release of tap. (g) If possible, submit thread length, and overall length of tap desired with blue print.

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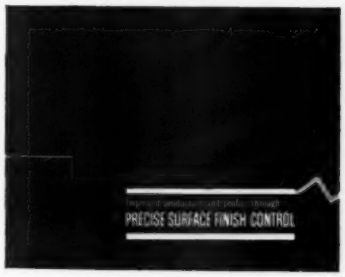

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